

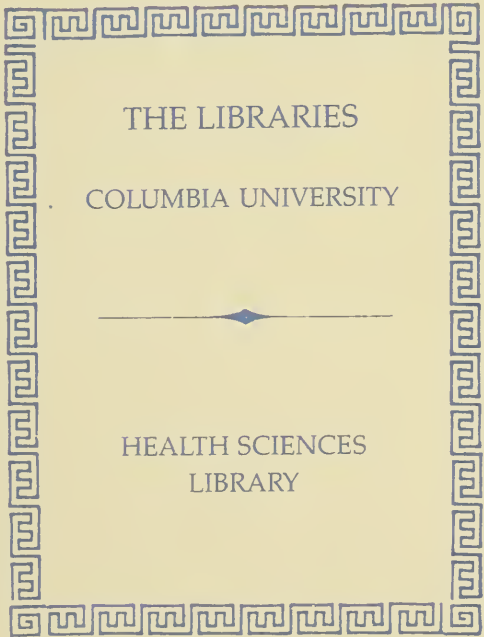
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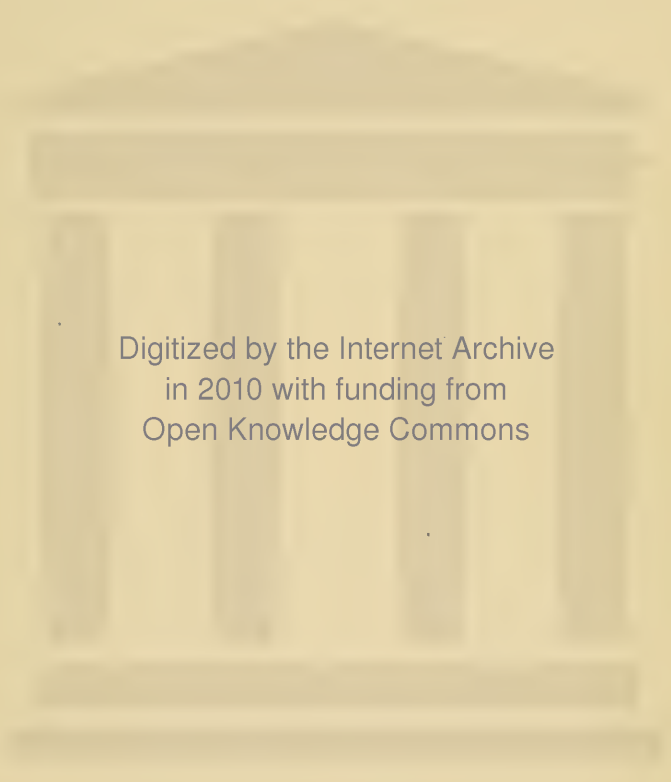
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THE MODERN TREATMENT
OF
STONE IN THE BLADDER BY LITHOLAPAXY.



THE
MODERN TREATMENT
OF
STONE IN THE BLADDER
BY
LITHOLAPAXY.

*A DESCRIPTION OF THE OPERATION AND INSTRUMENTS,
WITH CASES ILLUSTRATIVE OF THE DIFFICULTIES
AND COMPLICATIONS MET WITH.*

BY
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PREFACE.



IN this little work I aim at placing before my professional brethren a guide to the modern treatment of stone by litholapaxy of a thoroughly practical character. In addition to a detailed description of Bigelow's operation and the instruments employed therein, I have devoted particular attention to the difficulties and complications met with, and illustrated these, and what I consider the best means of dealing with them, by detailed cases from my own practice, now extending to more than six hundred cases of this operation.

The present edition has been thoroughly revised; a new chapter is added, giving details of those precautions necessary in the operation as applied to male children, and to females of all ages; and some difficulties untouched in the former edition—notably, the removal of encysted calculus by the modern operation—are described and illustrated.

A new method of diagnosis for small calculi, first brought to the notice of the profession by me in 1884; is illustrated and elaborated.

I have to thank the medical press generally and many leading surgeons for their very favourable reception of the former edition of this work ; and it is particularly gratifying to me to learn from many young surgeons, especially my former fellow-workers in India, where unrivalled opportunities abound for the practice of litholapaxy, that my writings have been of some practical aid to them in commencing this operation.

46, HARLEY STREET, LONDON.

May, 1896.

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CHAPTER I.

INTRODUCTORY.

SOME eighteen years have now elapsed since the late Professor H. J. Bigelow, of Harvard, U. S. America, startled the medical profession by the introduction of his new operation for stone in the bladder. This operation, which he named 'Litholapaxy,' consisted in crushing and at once evacuating through the natural passages, at one sitting, the whole of the stone, no matter how large and hard, provided that it could be caught and crushed by the large lithotrites then introduced. The proposals involved in this operation struck at the roots of all our most cherished tenets regarding the removal of stone by the old operation of lithotripsy, introduced in France by Civiale, and practised in this country by a few surgeons, but chiefly by Sir Henry Thompson, who may be regarded as the apostle of the old operation, and through the advocacy and practice of which he had built up his great reputation.

The first to exhibit Bigelow's instruments and demonstrate his operation in this country was Mr. Reginald Harrison, at the meeting of the British Medical Association in 1878. Harrison, who had witnessed Bigelow operate in America, thought well of the new operation, which, however, did not receive a very cordial reception from the medical profession or press in England.

The attitude with which Sir Henry Thompson received the new proposal at the outset; the ridicule heaped by him on

Bigelow's instruments ; his subsequent attempts, on finding the operation a successful one, to show that there was nothing new in it, in fact that he himself had been leading up to it, even doing it, for years—thus detracting from the reputation of an American brother—are now matters of history, and redound neither to the foresight nor generosity of British surgery.

Now, everyone who knows anything about the history of lithotrity must be aware that previous to the appearance of Bigelow on the scene, in 1878, the tendency of all lithotritists was (1) to restrict to the lowest possible limit the time occupied at each sitting, four or five minutes being the utmost time allowed as safe ; (2) to employ instruments of the smallest size possible ; and (3) to leave the evacuation of the fragments as much as possible to natural efforts. The principles on which this practice was founded were : (1) That the bladder was extremely intolerant of the presence of instruments ; and (2) that in direct proportion with the length of time instruments were manipulated there was the prospect of evil consequences resulting. There can be no doubt as to the teaching that prevailed on the subject. A reference to the latest editions of all the ordinary text-books published prior to 1879 will show that the authors were unanimous on these points ; and there was no one who inculcated the principles and practice referred to more strongly than Sir Henry Thompson himself, as might be illustrated by numerous extracts from his writings. It was reserved for Professor Bigelow to show that these principles were altogether wrong, and to introduce a practice entirely at variance with the old proceeding. The hypotheses on which the new operation was based were : (1) That the bladder was much more tolerant of prolonged manipulation than was previously supposed, and (2) that the temporary manipulation of blunt and polished instruments in the bladder was less irritating than the

continued presence in the organ of sharp fragments of calculus. For the purpose of working out his idea Bigelow introduced larger lithotrites than had previously been used, and invented an entirely new evacuating apparatus by which débris might be rapidly extracted from the bladder. In the introduction of the large evacuating cannulæ, Bigelow availed himself of the discovery of Otis, that the urethra is much more capacious than was previously recognized.

My own lines were at that time cast in India, where ample opportunities were available for putting the new operation to the test. Lithotrixy had never become popular in that country, owing partly to the aversion with which Orientals regard any method of treatment that involves several distinct surgical proceedings, extending over an indefinite period. As with many of my professional brethren in India, lithotomy in my hands had proved a fairly successful operation. I did not, therefore, at first abandon the cutting for the new operation. I must confess, however, that the main cause of my hesitation in adopting the new operation was the depreciative manner in which it was criticised by Sir Henry Thompson on its introduction. I need scarcely say that English surgeons had been in the habit of receiving as almost equivalent to divine law the utterances of that distinguished surgeon on any point connected with the surgery of the urinary organs. When, therefore, I read of the ‘disastrous’ results that he anticipated from Bigelow’s operation, I naturally hesitated in adopting it. And it was not till I had subsequently read of the excellent results Sir Henry himself had obtained from that operation, with reference to which he had uttered such gloomy forebodings, that I finally decided on giving the operation a trial.

Shortly after I gave expression to this fact in the *Lancet*, I was favoured by a very friendly letter from Sir Henry Thompson, in the course of which, referring to my article in

that journal, he says : ‘ I felt much pained at your belief that I had opposed the operation at the outset, or foretold it would be “ disastrous.” All I can say is that I have no recollection of having done so.’ And again : ‘ I expressed my dislike to Bigelow’s *instruments*, a dislike I still maintain ; but his method I have never opposed, and, since trying, have never failed to espouse and to praise.’

Now, I should be extremely sorry to misrepresent Sir Henry Thompson, but, after a re-perusal of his utterances on the subject, I must say that his writings, which on other subjects are so lucid, on this render him liable to misinterpretation. I shall reproduce later on the quotations from Sir Henry Thompson’s writings above alluded to, and the reader will have an opportunity of judging for himself the meaning they convey.

As soon as I could procure the necessary instruments from England, I commenced at once, in 1882, to give the new operation a fair and unprejudiced trial, and in 1885 published in the *Lancet** full details of my first 111 cases. In that paper I challenged the position assumed by Sir Henry Thompson with reference to Bigelow’s operation, and I venture to say that the results obtained, from what was at the time a comparatively large number of operations by this method, put an end once and for all to those theoretical objections and gloomy forecasts put forward by surgeons brought up in the prejudices of the old school of lithotrity.

My experience of Bigelow’s operation now extends to 610 cases, and to 864 operations for stone in the bladder by all methods, and so satisfied am I with the results obtained that, as will be seen later on, I have now practically abandoned all other methods in favour of Bigelow’s. In recording my cases, it has been my custom to jot down in my note-books any observations or reflections of a practical character that

* February 28, March 7 and 14.

occurred to me at the time of operating, and it is from these notes that the following pages are mainly built up. No practice is here advised and no principle inculcated that has not been fully subjected to the test of my own experience. It is hoped that the illustrative cases given in detail, dealing with the various difficulties and complications met with in this operation, will be particularly useful to surgeons commencing this branch of surgery.

CHAPTER II.

THE INSTRUMENTS EMPLOYED IN LITHOLAPAXY.

To appreciate fully the great revolution in the surgery of the bladder involved in Bigelow's operation, it will be necessary to give a brief sketch of the history of lithotrity, and this will involve a description of the development of one of the essential instruments of the modern operation—viz., the lithotrite.

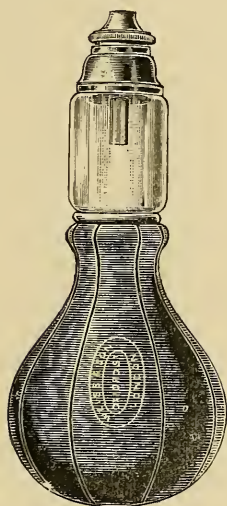
Though cutting operations of various kinds for stone have been practised from the earliest ages, it was not till the beginning of the present century that the idea of removing a stone by pulverizing it within the bladder, and allowing the *débris* to escape by the natural passages, was entertained. The first to crush a stone on scientific principles was the great French surgeon Civiale, in 1824. This he effected by the 'trilabe,' a species of drill consisting of a central axis and three claws, which, after introduction of the instrument into the bladder through the urethra, were made to project and catch the stone. The reduction of the stone to fragments was effected by drilling holes in it in various directions till it crumbled into *débris*. The operation, which he named 'lithotrity,' extended over several sittings, the fragments passing away naturally with the urine. It will be observed that the disintegration of the stone was accomplished by a drilling rather than by a crushing process. Shortly afterwards a great improvement was effected by Weiss, of London.

He constructed an instrument by which the stone was grasped between two short blades, bent at an angle with the shaft, and reduced to fragments by a true crushing process. And, though various improvements have since been effected, it may be said that this is the model on which all modern lithotrites are constructed.

In the development of the lithotrite, various changes have been made in the method of applying the motive power by which the stone is crushed between the blades. Thus, in Heurteloup's time, the patient was placed in a peculiar-shaped bed, to which a vice was attached. After the lithotrite was introduced into the bladder, and the stone grasped between its jaws, it was fixed in the vice, and the stone reduced to débris by blows of a hammer applied outside. Some time after, a great improvement was effected, in the introduction of the screwing process by Hodgson, of Birmingham. Sir William Fergusson advocated the rack-and-pinion system in the lithotrite, but the screwing process is that generally now adopted. Lastly, Sir Henry Thompson adapted the cylindrical handle to the lithotrite; and this, combined with Weiss's method, by which the sliding action may be converted into a screwing one, is now generally employed in the construction of modern lithotrites.

Turning aside temporarily from the instruments, let us glance at the principles involved in the operation. As already mentioned, Civiale's practice was to crush small quantities of stone at repeated sittings, each extending over a few minutes only, the detritus coming away by natural efforts with the urine. From time to time, however, attempts were made to assist Nature in getting rid of the débris by artificial means. For this purpose currents of water, injected into the bladder through a large catheter from a syringe, were employed by Heurteloup and others. In 1846 Sir Philip Crampton, of Dublin, invented a suction apparatus resembling a large

soda-water bottle with a tap at the neck, which was exhausted of air, and then applied to a catheter previously introduced into the bladder, and, in this way, an attempt made to get rid of the fragments. Subsequently, Mr. Clover designed his syringe (Fig. 1), which consisted of an indiarubber bulb with



$\frac{1}{3}$ SCALE

FIG. 1.

a glass receiver, from which water was pumped into, and withdrawn from, the bladder through a catheter, No. 12 or 13; and in this way a certain quantity of sand was brought away. Then, again, Sir William Fergusson endeavoured to complete the operation at one sitting by withdrawing the fragments through the urethra by means of long and slender lithotrites. Sir Henry Thompson, though apparently adverse to this method at first,* subsequently employed it for a time.† But it came to be regarded by the profession as a very dangerous process, often inflicting severe injury on the urethra.

All these methods of artificial evacuation of débris were invented with a view to obviate the recognized danger of allowing rough and sharp fragments of stone to remain in the bladder—a common cause of cystitis. Each method enjoyed a temporary, though transient, notoriety; but they one and all fell into disrepute, for the simple reason that they failed to accomplish the object at which they aimed, and, at the same time, caused a great deal of irritation. And the practice which Civiale had inculcated—of short and frequent sittings, the débris being allowed to come away by

* 'Lectures delivered at the College of Surgeons, England, 1884,' by Sir H. Thompson, p. 117.

† 'Lithotrity at One or More Sitzings' (*Lancet*, vol. i., 1879, p. 145).

natural efforts—came eventually to be recognized, by universal consensus of opinion amongst the profession, as the most safe and judicious.

Such was the position of lithotrity in 1878, when Bigelow appeared on the scene with his new operation, and proposed to revolutionize the whole system by crushing and evacuating the stone at one sitting, no matter how prolonged, and no matter how large the stone might be, provided only that it was capable of being grasped and crushed by the large lithotrites then proposed.

Bigelow's operation practically resolves itself into two proceedings—the reduction of the stone to fragments, and the evacuation of the débris from the bladder.

The crushing of the stone is accomplished by means of lithotrites, similar to those employed for the old operation of lithotrity, except that, owing to the increased scope of the new operation in dealing with large and hard calculi, some of the lithotrites employed for adults are constructed much larger and stronger than those formerly in use. On the other hand, owing to the more recent extension of the modern operation to male children of the most tender ages, extremely small and slender lithotrites are now employed. In Fig. 2 is illustrated a lithotrite constructed on the well-known model of Weiss and Thompson. It possesses the cylindrical handle introduced by Sir Henry Thompson, which (in the words of the inventor) 'enables you, in the search for a small stone or fragments, to execute rapid and delicate movements which

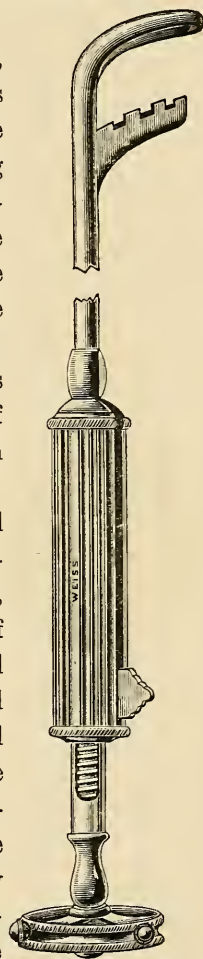


FIG. 2.

would be impossible in an instrument without the cylindrical handle.' It also possesses the new mode of changing sliding into screwing action, and *vice versâ*, introduced by Weiss. When the small button in front of the cylinder is pushed back into the position indicated in the illustration, the instrument is 'locked,' and then the male blade moves within the female blade by a screwing action only; but when the button is pushed forward in the direction of the blades, the instrument

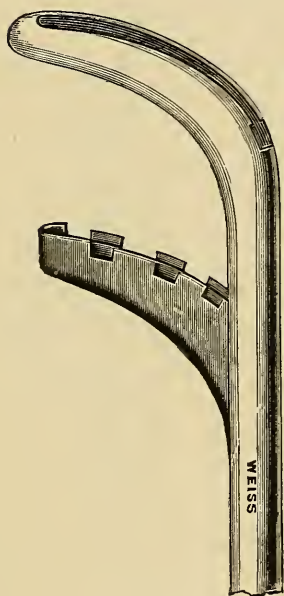


FIG. 3.



FIG. 4.

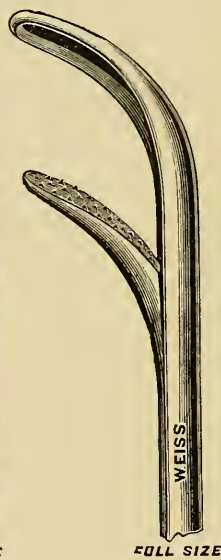


FIG. 5.

is 'unlocked,' and the screwing is converted into a sliding action.

For the operation of litholapaxy, three varieties of this instrument are commonly employed: (1) A fully fenestrated lithotrite (Fig. 3) for crushing large and hard stones. The male blade, which is deeply serrated or toothed, passes through the female blade, driving the débris through the

opening in the latter, or tossing it away on either side, so that no blocking of the blades by fragments can occur. (2) A flat-bladed, non-fenestrated lithotrite (Figs. 4, 5), which is used for reducing fragments into fine powder, after the coarse work of breaking up the stone has been effected by means of

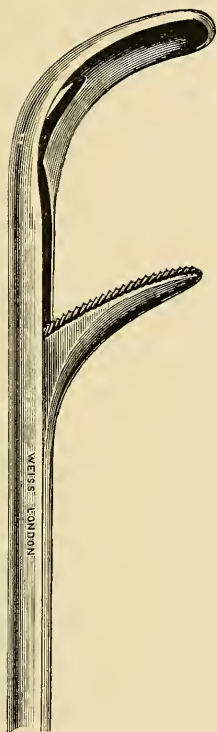


FIG. 6.

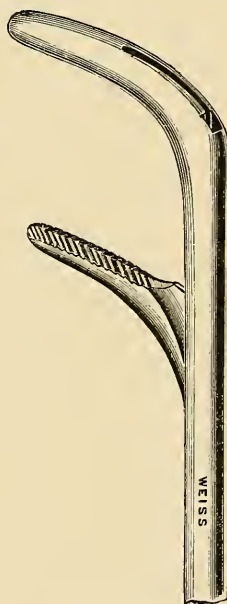


FIG. 7.

the fenestrated instruments. (3) A partially fenestrated lithotrite (Figs. 6, 7), with an opening in the heel of the female blade, used for the same purpose as the latter, and also to crush small and medium sized calculi.

For some years after I began to practise litholapaxy I used these non-fenestrated and partially-fenestrated instruments



FIG. 8.

a good deal ; but I gradually came to abandon them, and now use none but fully-fenestrated lithotrites in my practice. I consider the use of any other kind unnecessary, and almost unjustifiable, considering the danger that exists of *débris* getting impacted in the jaws of non-fenestrated instruments, an accident which cannot occur with fully-fenestrated ones when properly used. The use of the lithotrite in the modern operation is to *crush*, never to *fish out*, the fragments, a rôle to which, as we have seen, it was frequently consigned in the old operation of lithotrity. Indeed, I cannot conceive any circumstances in which it would be advisable to use a non-fenestrated lithotrite in the modern operation.

Sir Henry Thompson writes :* ‘ A collateral advantage of this flat-bladed instrument is, that it will hold a good deal of *débris* without undue augmentation of its size, so that not a little can be safely brought away by the urethra, if desired, whenever the instrument is withdrawn.’ In writing thus, four years after Bigelow’s operation was introduced, Sir Henry evidently confounds the old and new operations. ‘We should,’ as Bigelow says, ‘ distinctly recognize that what can be withdrawn in a lithotrite could come better through a tube, and that the only province of the lithotrite should be to pulverize, or, indeed, merely comminute, and not to evacuate.’

In Bigelow’s lithotrite (Fig. 8), the cylin-

* ‘ Diseases of Urinary Organs,’ sixth edition, 1882, p. 78.

dricial handle of Thompson's instrument is retained for the left hand; but for the wheel for the right hand a ball is substituted. This is an undoubted improvement, affording a much firmer purchase—a point of great importance when dealing with a large and hard calculus. But the special feature of Bigelow's lithotrite is the introduction of a new mode of locking the instrument. This is effected simply by a quarter rotation of the right wrist, whilst the hands are in position, without any displacement of the fingers; whilst a quarter rotation of the wrist in the opposite direction unlocks the instrument. In the lithotrite of Weiss and Thompson, the thumb of either hand has to be disengaged to move the button, a performance which tends to render the lithotrite in the bladder unsteady at the critical moment of catching the stone. By the ingenious device of Bigelow this objection is obviated—a decided improvement. On the whole, the movements of this lithotrite are easier and more graceful than in any instrument I have ever worked with. So much for the handle of Bigelow's lithotrite.

I cannot say, however, that I like the blades of this instrument nearly so well as those of the fenestrated lithotrites by Weiss and Thompson already described. 'The blades (Fig. 9) of this lithotrite consist of a shoe, or female blade, the sides of which are so low that a fragment falls upon it; while the male blade, or stamp, offers a series of alternate triangular notches, by whose inclined planes the detritus escapes laterally after being crushed against the floor and rim of the shoe. At the heel of the shoe, where most of the stone

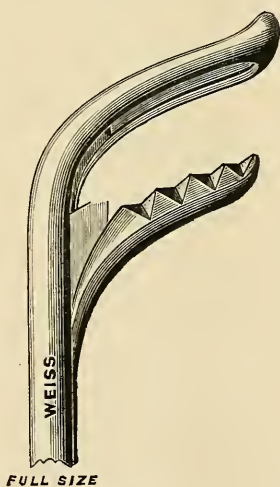


FIG. 9.

is usually comminuted, and where the impact is therefore greatest, the floor is high and discharges itself laterally, while its customary slot is made to work effectually' (Bigelow). The blades are essentially non-fenestrated, and liable to get clogged with débris, as I have frequently found in practice, and, therefore, objectionable.



FIG. 10.

In 1886 I had constructed for me by Weiss a lithotrite (Fig. 10), in which the handle and locking action of Bigelow are combined with the fenestrated blades of Weiss and Thompson. The female blade is completely fenestrated, the male blade passing right through the female blade, so that when closed their under surfaces are flush with each other, and thus all fear of impaction of fragments is avoided. The upper edges of the female blade are smooth, and bevelled on their inner aspect, so that there is much less chance, even in unpractised hands, of the mucous membrane of the bladder getting nipped between the blades than in those lithotrites in which the upper edges of the female blade are toothed. Ten years' acquaintance with this lithotrite enables me to say that it is practically perfect in its working; and it is the model on which my lithotrites have since been constructed.

Fig. 11 represents a lithotrite which Harrison has recently had constructed, in which both the wheel- and ball-handles are replaced by a curved and flat crossbar, like the handle of a corkscrew. The locking-action used by Guyon and French surgeons generally is also introduced. I have no personal experience of this instrument, but I have seen my friend Mr. Harrison work with it, and he tells me that he

finds this crossbar a great relief to the hand, particularly when dealing with large calculi.

The second object aimed at in the operation—the removal of the débris from the bladder—is accomplished by means of large cylindrical tubes, or evacuating catheters, introduced through the urethra, and an aspirator, or suction apparatus, attached thereto.

Some time before the introduction of Bigelow's operation, it had been demonstrated by Otis, of New York, that the urethra in the adult male is much more capacious than had previously been imagined; and this discovery undoubtedly paved the way towards the development of the new operation. The cannulae employed vary in size according to the capacity of the urethra, Nos. 6 to 11, English scale, being used for male children, and Nos. 12 to 20 for adults and females of all ages. In my own practice I have not found it necessary to use a larger cannula than No. 18; and through a tube of this calibre I have removed the débris of a calculus weighing $6\frac{1}{4}$ ounces. I have, however, met with cases in which a No. 19 or 20 cannula might have been

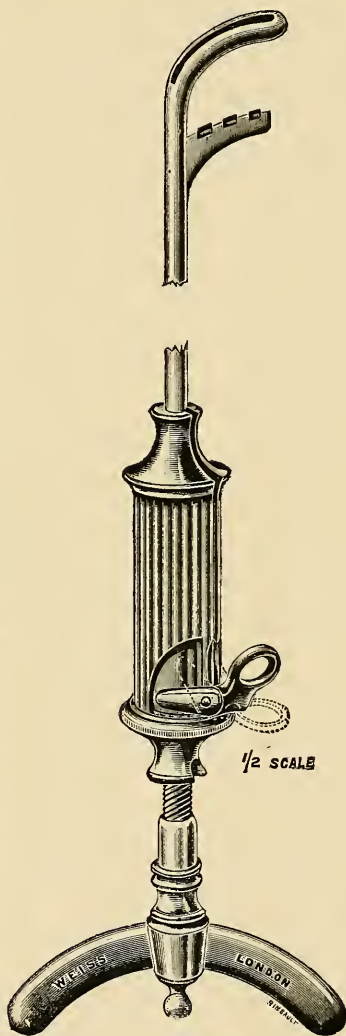


FIG. 11.

passed with facility. Cannulæ are made of thin silver, and vary in shape, some being straight, and some slightly curved at the extremity (Figs. 12, 13). The latter I prefer, as I find them more easy of introduction. The orifice, or eye, should be large enough to admit any fragment that will pass through

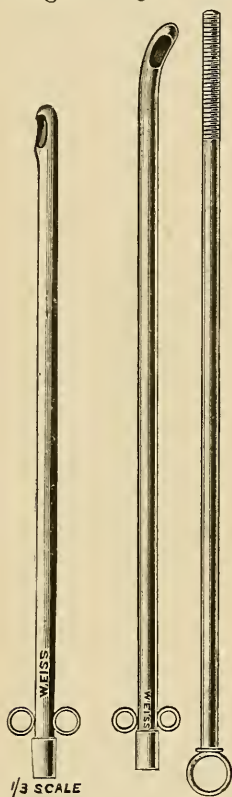


FIG. 12.

FIG. 13.

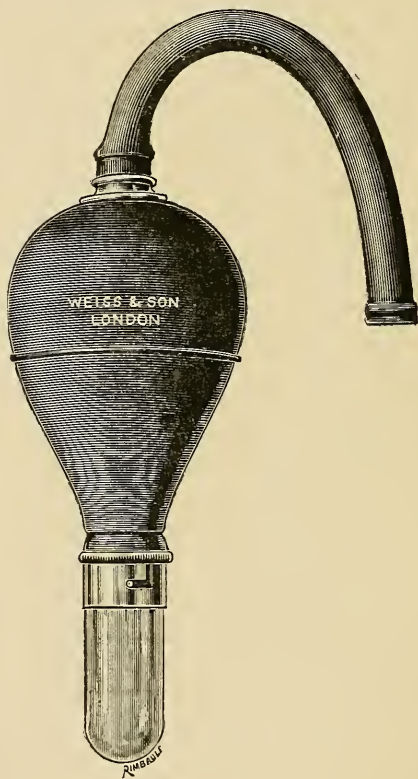


FIG. 14.

the tube. The cannulæ should be armed with stylets (Fig. 13), for reasons that will appear later on.

Though the evacuating catheters remain much the same now as on their introduction by the originator, several modifications have been effected in the aspirator; and these I shall

now describe, indicating the varieties of aspirator that I have found most effective.

The original aspirator of Bigelow is represented in Fig. 14. It consists of an elastic bulb or central portion, to the lower extremity of which is attached a removable cylindrical glass receiver; whilst from its upper part passes an indiarubber

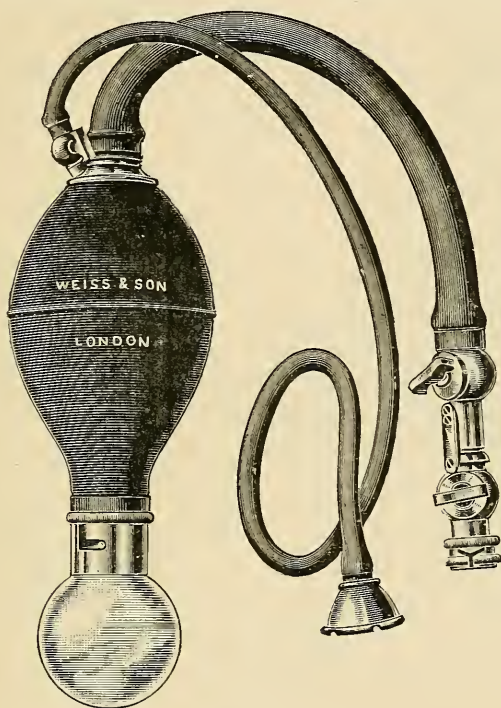


FIG. 15.

tube, the end of which fits on to the evacuating catheter previously introduced into the bladder. The apparatus, previously filled with water, acts as a kind of syphon. By alternate compression and expansion of the bulb, the water is pumped into, and withdrawn from, the bladder, and the débris, which is carried back into the aspirator, falls down into the glass receiver, and is there retained.

The next form of Bigelow's aspirator is represented in Fig. 15, to which is added an elastic tube or hose, provided with a stop-cock close to its junction with the bulb. By this hose water can be introduced into the aspirator from a neigh-

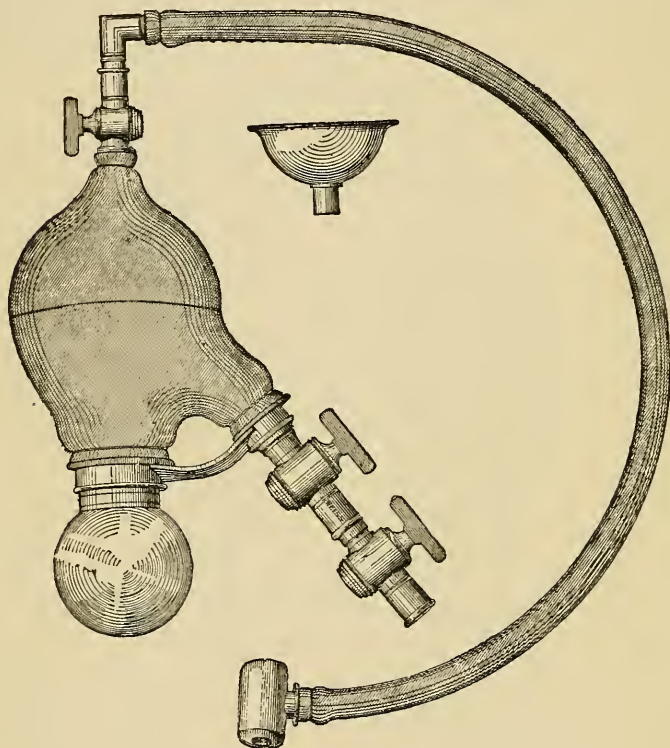


FIG. 16.

bouring vessel without disturbing the apparatus. There is also an extra stop-cock for the evacuating catheter.

In Bigelow's more recent aspirator (Fig. 16), the long flexible elastic tube intervening between the bulb and the evacuating catheter is dispensed with, the catheter fitting into a brass tube, provided with a tap, inserted into the side of the bulb near the glass receiver. The distance between the

bladder and the aspirator is thus much shortened. At the upper part of the bulb is a tap by which air escapes, and is excluded from the apparatus when filled with water. A feature of the new aspirator was the introduction of a strainer (not shown in the woodcut) for preventing the return of débris from the receiver into the bladder. This strainer was formed by a prolongation within the bulb of the brass tube, which fits on to the catheter, in the form of a perforated cylinder.

In practice I soon found that the extra stop-cock and hose were not essential, and that the rough surface of the perforated strainer impeded the free flow of débris from the bladder into the receiver. In fact, the strainer in this form of aspirator is superfluous, as fragments of stone that once pass into the receiver cannot return into the bladder. These append-

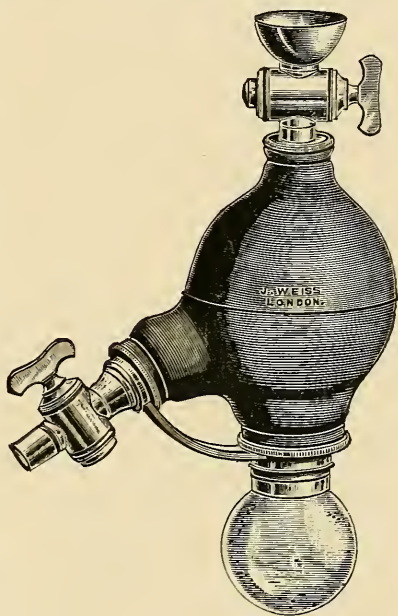


FIG. 17.

ages are dispensed with in the modification of Bigelow's aspirator represented in Fig. 17, with which I have worked for several years, and which is thoroughly efficient in all respects.

I have recently had this latter aspirator simplified still further by dispensing with the tap above the rubber bulb, which is not really necessary, as the apparatus can be easily filled through the front tap, to which the cannula fits. This may be effected still more rapidly by removing this tap, which

fits on to the bulb by means of a bayonet-joint, filling the apparatus with the fluid, replacing the tap, and then pouring in a little more fluid to completely exclude air before closing the tap. This (Fig. 18) I now consider the simplest, handiest, and most practical modification of Bigelow's aspirator yet introduced; and it has the additional advantage of being comparatively moderate in cost.

We now come to the modifications of Bigelow's aspirator

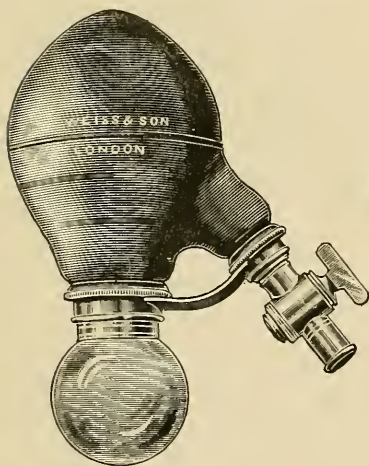


FIG. 18.

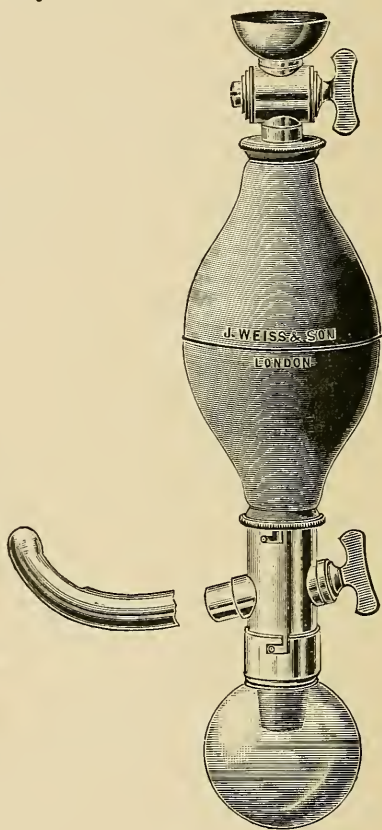


FIG. 19.

used by Sir Henry Thompson, of which there are no less than four.

The earliest variety (Fig. 19) consists of a stout indiarubber bottle, on the upper part of which is a tap, and above this a small funnel through which the bottle is to be filled. At the lower end is a brass tube, attached to which are the lower tap

and the glass receiver. The evacuating catheter is applied to the metal tube opposite the tap. The brass tube, to which the glass receiver is attached by a bayonet-joint or screw, is continued down a short way into the glass globe, thus acting as a trap to prevent the return of the fragments from the receiver.

In the aspirator just described, the glass receiver is placed directly beneath the indiarubber bulb, and it is found in practice that the débris in the receiver is disturbed by the currents of water produced by the alternate compression and expansion of the bulb. Some of the débris passes back into the bulb, and from there a portion is carried again into the bladder by the return stream.

To obviate this, Weiss suggested that the brass cylinder with glass receiver be removed to the front of the indiarubber bulb (Fig. 20), in which position its contents would be less influenced by the currents passing over the mouth of the receiver. When the aspirator is in action, the greater portion of the débris falls down into the receiver, as the stream from the bladder, diminished in force, passes the empty chamber over its mouth. Some, however, enters the bulb, and is carried back again with the reverse stream ; but the catheter-

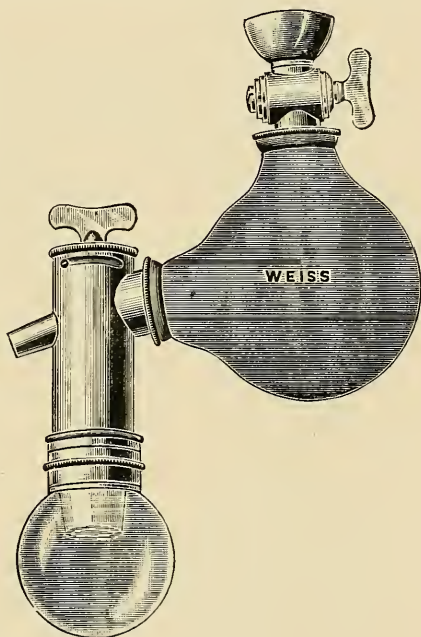


FIG. 20.

opening in the cylindrical chamber being much smaller than the opening into the bulb, most of the fragments impinge against the sides and front of the cylindrical chamber, and fall down into the receiver. Still, a little *débris* does pass back into the bladder, to be again withdrawn. Now, as Bigelow remarks :* “ We may fairly assume that a surgeon would not deliberately inject foreign bodies into a patient’s bladder, so there must be something wrong in a system which obliges him to do this, and makes it necessary to aspirate the same *débris* twenty times over in order to remove it. In short, the apparatus, as commonly arranged, is still a defective one, and needs some special contrivance to assist the action of gravity in securing the *débris*.” Admitting the force of these remarks, the objection raised is to a certain extent theoretical. I have worked with this variety of aspirator a great deal, and have found it efficient. The great drawback to this aspirator is that a large proportion of the *débris*, instead of falling down into the glass receiver, passes back into the indiarubber bag, so that one may be deceived as to the amount of *débris* extracted.

In Figs. 21, 22 are illustrated Sir Henry Thompson’s most recent forms of aspirator. In the first of these, for the brass cylindrical chamber and globular glass receiver in his previous instruments we have now substituted a plain glass cylindrical receiver, somewhat resembling the glass trap in Clover’s original syringe. A special feature in this aspirator is the introduction of a light wire valve, attached inside the chamber for the *débris* to the tube which receives the evacuating catheter. Its action is thus described by Sir Henry : ‘ When pressure is made on the indiarubber globe, and the current flows by the evacuating catheter into the bladder, this light valve is driven close to the aperture, and no *débris* can leave the glass trap. When pressure is removed, and the current

* *Lancet*, January 6, 1883, p. 6.

returns from the bladder, the valve floats widely open, and permits the débris to enter unchecked.'

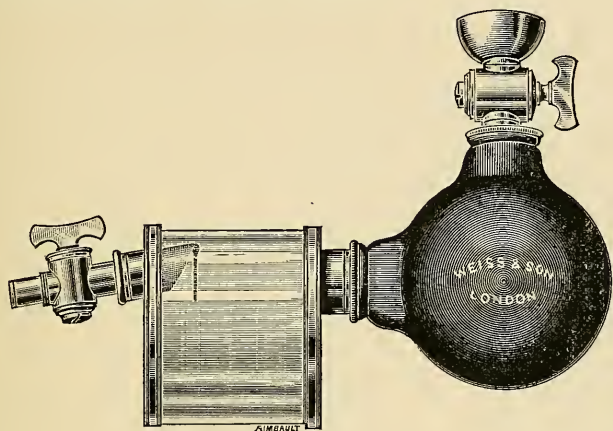


FIG. 21.

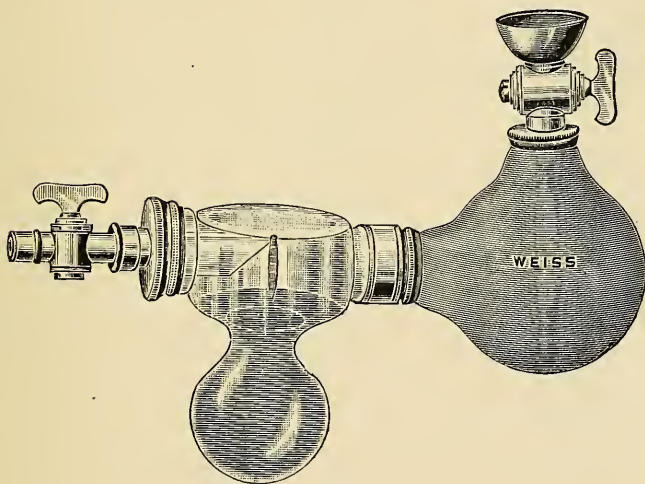


FIG. 22.

The aspirator pictured in Fig. 22 differs from the latter only in the shape of the glass receiver.

These two recent forms of aspirator, which Sir Henry

Thompson says* are 'not far removed from the original pattern of Clover,' are not nearly so efficient as his previous one (Fig. 20). From their length and want of balance they are very awkward in practice. The current of water passes directly into the receiver and disturbs the débris lying there,



FIG. 23.

Clover, efficiency is sacrificed to appearance, for the sake of assigning to the latter apparatus a position which neither the

and the valve, as Sir Henry himself admits, 'is sometimes liable to be partially blocked, as when mucus and fine débris are present.' In fact, a previous remark† of Sir Henry Thompson, when criticizing Bigelow's views as to the construction of a new aspirator: 'All the perforated tubes and strainers get so blocked with débris (as I found long since) in the human body—not with coal in water—as to be practically useless there,'—is, to a large extent, applicable to his new forms of aspirator. In the desire to produce an aspirator resembling the original syringe of

* *Lancet*, April 12, 1884, p. 653.

† *Ibid.*, vol. i., 1883.

inventor nor any other surgeon, except Sir Henry Thompson, has claimed for it.

I have almost annually for several years past spent a portion of my holidays in observing the surgical work done in

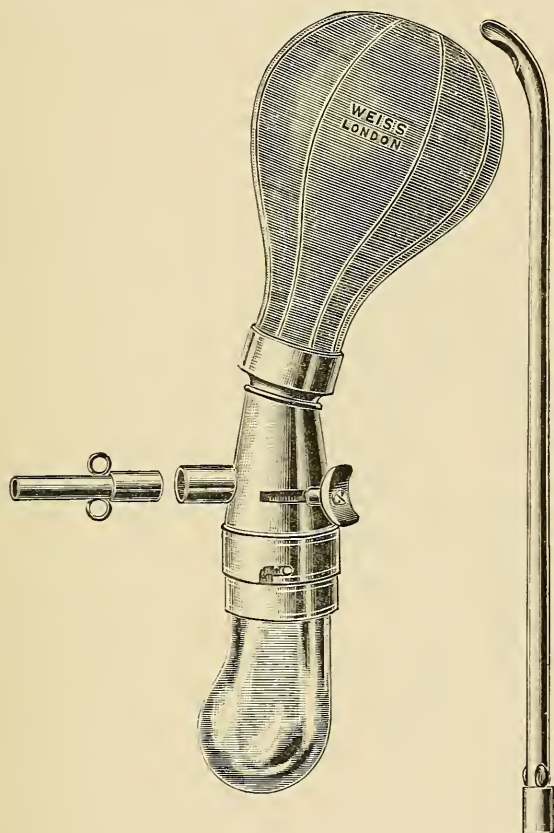


FIG. 24.

the Paris hospitals, and particularly the surgery of the genito-urinary organs in Professor Guyon's *clinique* at the Necker Hospital. No one has a greater admiration for the excellent work done by Dr. Guyon than I have. I was, therefore, much astonished at the inefficiency of the aspirator (Fig. 23) which

bears his name. It will be observed that in this apparatus the cannula, when applied, forms a right angle with the tube carrying the lower tap, and intervening between it and the body of the aspirator. This tube has a hollow cylinder of glass let in between two portions of soft rubber tubing,



FIG. 25.

through which the débris can be seen passing from the bladder. Owing to the sharp angle between the cannula and the tube, the multiple composition of the latter, and the length of the stream, the current is extremely weak, and incapable of extracting coarse débris from the bladder. Professor Guyon, however, depends on repeated injections of water from large glass syringes through the cannula into the bladder for the removal of the coarse débris, which flows out with the return stream; and the aspirator is used only towards the conclusion of the operation for the removal of fine débris.

Mr. J. H. Morgan, of Charing Cross Hospital, has designed an aspirator (Fig. 24) which is light and handy. I have not had much experience of this apparatus, but Mr. Morgan himself, Mr. Reginald Harrison and others report favourably of it.

Fig. 25 represents Keegan's aspirator; I have never had an opportunity of using it; but Dr. Keegan tells me that it is

a very efficient aspirator, and I need scarcely say that no higher authority on the subject exists.

The aspirators designed by Golding-Bird and Otis are

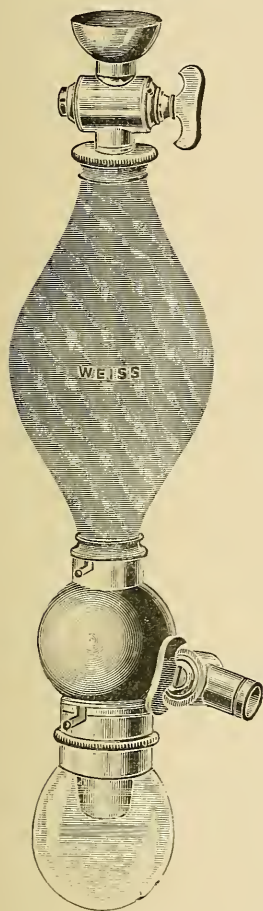


FIG. 26.

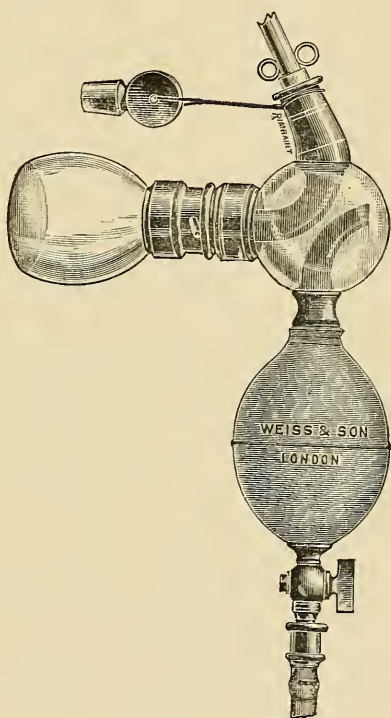


FIG. 27.

represented in Figs. 26 and 27 respectively, and do not require further description.

Such, then, are the chief varieties of aspirator before the profession. There are many others, which it will be un-

necessary to refer to here. In fact, there are few surgeons of repute who practise litholapaxy who have not designed aspirators to suit their own peculiar views. But they are, one and all, modified imitations of Bigelow's original instrument. All those described are efficient evacuators; but the most convenient and effective are, in my opinion, those represented in Figs. 17 and 18.

CHAPTER III.

THE OPERATION OF LITHOLAPAXY.

HAVING in the previous chapter given a sketch of the special instruments employed in the operation of litholapaxy, I will now proceed to describe in detail the various stages of the operation. I will assume that a stone of moderate size has been diagnosed in an adult, and its presence confirmed by the sound.

It will be well in all cases to submit the patient to preliminary treatment for a few days previous to undertaking the operation. The patient should be put to bed and placed on a light, nourishing diet. The bowels should be regulated, a purgative, such as castor-oil, being given should constipation exist, and mild astringents should the patient suffer from diarrhœa, which is often the case. Barley-water, with alkalies and tincture of hyoscyamus, should be given if there be much irritation of the bladder with acidity of the urine.

For the operation, I find a low, narrow operating-table the most convenient. The patient is placed on this, close to the right edge, with his head resting on a pillow. The buttocks are raised by means of a low cushion placed beneath them. This is an important point, as the stone thus gravitates to the base of the bladder, away from the neck, and renders the latter part, which is the most sensitive, less likely to be injured in the various manipulations. The legs and thighs

are flexed and slightly abducted, and held in this position by an assistant on either side.

In the cold weather it is very essential that the patient should be protected by warm clothing during the operation, to prevent chill. For this purpose a pair of large woollen stockings should be slipped on, reaching right up the thighs close to the groins. Such a pair of stockings can be made loosely out of an old blanket. In addition to the ordinary clothing, a light blanket should be thrown over the chest.

Close to the operator's right hand should be placed a small stand, or table, with a tray or basin containing warm carbolic lotion, in which the lithotrites and evacuating catheters should be placed ready for use; while the aspirator, previously filled with warm water, should be entrusted to an assistant conversant with its working. It is well, when possible, to have two aspirators ready at hand, to be used alternately. The operation is thus facilitated, as, while the surgeon is using one, the second can be emptied of *débris* and refilled with water by the assistant.

A small cup containing oil should be at hand for lubricating the instruments. In this operation too much oil cannot be used, the instruments being well lubricated at each introduction.

Before undertaking the operation of litholapaxy the surgeon must learn to pass all instruments—lithotrites, sounds, and catheters—on the right side. This requires only a little practice to do it with ease, and much time is saved thereby. Besides the loss of time involved, it is extremely awkward to see a surgeon passing the instruments on the patient's left side, and then going round to the right side to use them.

The patient now being, as a rule, anæsthetized, the surgeon, standing on his right side, should first pass a large conical steel sound into the bladder.

A series of highly-polished sounds of this kind (Fig. 28),

from No. 6 to 18, should be at hand. They should be made slightly tapering at the point, so that the diameter there is two sizes smaller than higher up at the bend. Solid heavy sounds of this kind are easily passed, and are handy for ascertaining the capacity of the urethra, and for facilitating the passage of other instruments. It will frequently be found that, when neither a catheter nor a lithotrite will pass into the bladder, a heavy sound of this shape will; and on its withdrawal the lithotrite or cannula may be slipped in.

The *meatus* is, as a rule, the narrowest part of the urethra, and it will frequently be found necessary, in order to pass the large instruments employed in litholapaxy, to enlarge it slightly. Should, therefore, a large sound not pass, this must be done at once. For this purpose a director is introduced into the urethra, and the floor of the *meatus* incised by means of a long slender scalpel. Or a urethrotome may be employed for this purpose. The operation is a very harmless one, and frequently procures an improvement on Nature.

The question now arises as to the quantity of water the bladder should contain during the crushing of the stone. As a rule, a very small quantity, from one to three or four ounces, will be sufficient to protect the walls of the bladder, and at the same time permit of the necessary movements of the lithotrite. A large quantity of water is objectionable, involving an increased area over which the fragments, impelled by the currents set up by the movements of the lithotrite, may roam, and thus increasing the



FIG. 28.

difficulty in catching them. If, on the other hand, the bladder be completely empty, injury to its walls may result from the lithotrite. For my own part, I am indifferent as to the quantity of water the bladder may contain, provided it be not too large.

The lithotrite is now introduced thus : The operator stands obliquely, with his left side towards the patient's face. The lithotrite, previously screwed home, locked and oiled, is held horizontally in the right hand by the cylindrical handle, with the beak pointing downwards. The penis is grasped between the thumb and two first fingers of the left hand, and the beak of the instrument introduced into the urethra, the penis being drawn slowly but steadily on to the lithotrite, which is gradually elevated till it reaches the perpendicular position, as it slides along the canal, which it does by its own weight. The beak will now have entered the membraneous portion of the urethra as it passes through the triangular ligament. By gently depressing the handle of the lithotrite in the middle line towards the horizontal position, the beak will be found to slip along the membraneous and prostatic portions of the urethra and into the bladder. As Sir Henry Thompson truly remarks : ' There is no more easy instrument to pass than the lithotrite with proper management.'

The lithotrite being thus introduced, the next stage of the proceedings consists in catching the stone. For this purpose the lithotrite is passed gently onwards, or, rather, allowed to proceed by its own weight, along the trigone, till it reaches the most dependent part of the base of the bladder, on which it is allowed to rest. The instrument is then unlocked, and the blades opened by withdrawing the male blade an inch or more, according to the size of the stone, the female blade being held steadily in position by the left hand on the cylindrical handle. The blades are now closed, when, frequently, the stone will be found between them. The lithotrite is

locked, and lifted slightly off the base of the bladder, and the stone crushed by screwing the male blade home. The instrument is again unlocked, the blades opened and closed, when a fragment will be caught, and crushed as before. This process is to be repeated several times, till a considerable quantity of fine débris is made. Sir Henry Thompson compares the finding of fragments to fishing for perch—where one is found there will many be caught. We must not go searching about the bladder for fragments till those in the locality in which the stone is first found are disposed of. The depression in the base of the bladder, caused by the weight of the lithotrite resting on it, facilitates the stone, and subsequently its fragments, falling on to the female blade. Surgeon-Colonel J. Richardson, before whom I had the pleasure of operating for the first time many years ago, writing a few days subsequently of the features in the operation that astonished him, says: ‘The next was the apparent ease with which the stone first, and afterwards its fragments, tumbled into the jaws of the instrument. It almost seemed as though they were anxious to get crushed.’

Should the stone not be found by the manœuvres above indicated, it must be searched for. This is done by opening the blades of the lithotrite, turning them at an angle of 45° towards the right, and again towards the left, and closing them in these positions respectively. Should the stone still evade detection, the handle of the lithotrite must be depressed towards the horizontal position between the thighs, pushed an inch or so towards the posterior surface, and the same manœuvres gone through in that position, searching centrally, right and left. The stone will probably be found in one of these positions, but sometimes it lies immediately behind the prostate, especially when that gland is enlarged. To grasp the stone in this position the handle of the lithotrite should be depressed between the thighs, and turned right round on

its axis, so that the beak points downwards towards the trigone, but should not touch it. The blades are then opened and closed as before in this position, and if the stone lies there it will be secured. In fact, the surgeon should make a mental survey of the whole bladder, and institute a methodical search of every part of it till the calculus is found. All the movements must be light and graceful, and care taken that the mucous membrane is neither caught between the blades nor otherwise injured. In whatever position found, the stone must be brought to the centre of the bladder and there disposed of.

Let us now assume that the stone, or a portion of it if a large one, has been reduced to fine *débris*. Should the stone be a small one—say, from a few grains up to 3 or 4 drachms in weight—its complete pulverization will probably be accomplished before the lithotrite is withdrawn, in a period varying from one to eight or ten minutes. But should the stone be a large one, a considerable amount of crushing, lasting over ten minutes or so, must be effected before removing the instrument. Before withdrawing the lithotrite, it must be locked and the blades screwed tightly home, so as to render them free of *débris*. I may here say that no instrument should be withdrawn from the bladder till quite free of fragments.

The evacuating catheter, armed with a stylet, should now be passed into the bladder, the largest size that the capacity of the urethra will easily admit being used. As soon as the stylet is withdrawn, a rush of water and *débris* will take place, to receive which a small tray or porringer should be at hand. The experience already gained in passing the solid sounds and lithotrites will afford a rough estimate of the size of cannula that the urethra will admit.

The cannula having been introduced into the bladder, the aspirator, previously filled with warm water, or boric solution,

is applied, the tap turned on, and aspiration of the débris begun. The right hand grasps the bulb of the aspirator, by the compression and expansion of which water is injected into, and withdrawn from, the bladder. With the outward stream the fragments are carried, and are seen to fall down into the glass receiver, where they remain. Should the stone be a small one, and have been completely crushed at the first introduction of the lithotrite, it will be found that, after the aspiration has gone on for a time, the whole of the débris will have passed into the receiver. But if the stone be a large one, after a considerable quantity of débris has entered the receiver, which will vary with the amount of crushing at the first introduction of the lithotrite, little or no débris returns with the outward stream, but a rattling sound takes place, due to the fragments too large to pass out being carried with force against the eye of the cannula.

The aspirator is then removed, the cannula, rearmed with the stylet, is withdrawn, and the lithotrite again introduced for the purpose of crushing more fragments. This is followed by the cannula and aspirator as before. This process may have to be repeated several times, according to the size of the stone, before the whole of the débris is removed.

Such, then, is a general description of the operation. There are, however, difficulties met with and points to be attended to, to which I wish to draw attention here.

In the healthy urethra of an adult there are only two situations, as a rule, where difficulty may be encountered in the passage of instruments—viz., at the triangular ligament, and at the neck of the bladder. The instrument (lithotrite or cannula) should first be passed as far as it will go in the direction of the anus, thus depressing the floor of the urethra in front of the triangular ligament. ‘Traction on the penis next effaces this depression, and adds firmness to the urethral walls; so that, if the instrument be withdrawn a little, and at

the same time guided by the bony arch above, it can be coaxed without difficulty through the ligament in question—a natural obstruction which physicians often mistake for a stricture. The obstruction passed, the rest of the canal is short, and corresponds with the axis of the body' (Bigelow).

The obstruction sometimes met with at the neck of the bladder is due to the firm lower edge of the inner meatus. This may be overcome by pushing the lithotrite or cannula gently onwards in the direction of the axis of the body, imparting to it a slightly rotary motion if necessary.

When the urethra is capacious, and large evacuating catheters can be passed, as in the great majority of cases in the adult, it is unnecessary to reduce the stone to fine sand, as coarse *débris* can pass through these tubes into the aspirator, and it is a waste of time to reduce the *débris* to a finer consistence than what will pass through the cannula with facility.

During the earlier part of the process of aspiration, the end of the cannula should be kept towards the centre of the bladder, raised from the base, and may be moved about slightly in various directions to facilitate the flow of the fragments towards the eye; but towards the completion of the process the cannula should be allowed to rest on the base, so as to gather up the sand and last fragments.

Towards the completion of the operation it will be found that, as a rule, the last particles of *débris* lie close to the neck of the bladder, just behind the prostate. This is due to the fact that the eye of the cannula being turned towards the posterior aspect and sides of the bladder, the water is less disturbed by currents in the position referred to than in any other. Consequently, the last particles of *débris* gravitate towards this spot. Towards the end of the operation, therefore, the eye of the cannula should always be turned right round towards the prostate, and water forcibly injected, so as to dislodge the *débris* from this position. This manœuvre is

especially necessary where enlargement of the prostate co-exists, otherwise a fragment might be left behind.

On compressing the bulb and pumping water into the bladder, the débris is scattered away from the eye of the cannula. Before allowing the stream to return by the expansion of the bulb, the hand should rest a second or two, so as to allow the débris to settle down again in the vicinity of the eye. The evacuation of the débris will sometimes be found to take place best by injecting three or four ounces of water into the bladder with each compression of the bulb; at others a much smaller quantity will be found most effectual. No definite rule can be laid down for all cases.

Sir Henry Thompson lays stress on the necessity of having the movements of the aspirator synchronous with those of the chest during respiration; the water being pumped into the bladder during expiration, and exhausted therefrom during inspiration. During my earlier operations I had recourse to this manœuvre a good deal, but I came long ago to regard it as an unnecessary, and, indeed, frequently impracticable, refinement. Patients vary so much in the rapidity of their breathing under the influence of an anæsthetic that the suggestion frequently cannot be attended to, even if desired.

It sometimes happens, even when the patient is fully anæsthetized, that spasm of the bladder occurs. During its existence all manipulation should be suspended, otherwise the bladder might be injured. This is a point to which Mr. Reginald Harrison has called attention,* and the precaution indicated is a wise one. Should the lithotrite be in the bladder, it must be closed and kept unmoved till the spasm passes over. If the cannula be in the bladder the water should be allowed to escape.

During the process of aspiration, with each expansion of the indiarubber bulb the fragments of calculi are carried against

* 'Lithotomy, Lithotritry,' etc., by R. Harrison, 1883, p. 35.

the eye of the cannula by the outward rush of water, and a clicking sound is thus produced, which, whilst it continues, indicates that some fragments remain in the bladder. There is, however, a peculiar sound sometimes produced, the occurrence of which the young litholapaxist should be acquainted with, as it is very likely to be confounded with the sound produced by a fragment. This 'false sound,' as it may be called, is produced by the mucous membrane of the bladder being sucked into the eye of the cannula during exhaustion of the water. It is most likely to occur towards the end of the operation, when all, or nearly all, the fragments have been exhausted, and especially when the bladder contains no surplus water, only that quantity which is pumped in and withdrawn during compression and expansion respectively of the bulb. It may, however, be produced at any time if, after compressing the bulb, the eye of the cannula be turned towards the sides, or directed up against the apex of the bladder, and the bulb of the aspirator be then allowed to expand. The sound itself, though difficult to describe, can never be mistaken when once recognized. The sensation communicated to the hand is of a fluttering, jerky character, accompanied by a dull, muffled sound, as contrasted with the clear, ringing click which the impact of fragments imparts to the instrument. On its occurrence the outward stream receives a sudden and complete check; whereas, when a fragment obstructs the stream, a portion of the water continues to flow. The sound does not recur if the cannula be partially withdrawn and raised towards the perpendicular position, so as to bring the eye close to the neck of the bladder, with the end of the cannula resting on the trigone; whereas a fragment will produce obstruction there as well as in any other position. On first practising litholapaxy I was deceived by this sound, and since then I have seen many young and inexperienced litholapaxists similarly deceived.

It frequently happens that, during the process of aspiration, a fragment which is too large to pass through the cannula gets caught in its eye. This is recognised by the fact that the outward stream is arrested, and the bulb of the aspirator ceases to expand. The fragment should at once be displaced. This, as a rule, may be effected by compressing the bulb suddenly and with force, when the fragment will be expelled by the inward stream. Should this manœuvre fail after being tried two or three times, a stylet should be introduced through the cannula, and the fragment displaced in this way. But the cannula should on no account be withdrawn with the fragment sticking in its eye, as in this way the urethra may be injured, or the fragment get caught in the mucous membrane, displaced from the eye of the cannula, and thus impacted in the urethra.

Should a fragment get impacted in the urethra, how are we to deal with it? If the precautions indicated in the last paragraph are taken, there will be little fear of its occurrence. Still, it is an accident that has to be reckoned on. If the fragment be lodged in the prostatic portion of the urethra, it may easily be displaced backwards into the bladder by passing a large cannula as far as the obstruction, applying the aspirator, and injecting water with some force, when, as a rule, the fragment will rush back into the bladder, to be there disposed of. If the fragment be arrested in the anterior three or four inches of the canal, it can be removed with one or other of the various kinds of urethral forceps in use (Figs. 29, 30, 31). When deeply placed in the membranous portion of the canal, it may still be removed in this manner; but, if tightly impacted, it may be necessary to remove it by external urethrotomy.

Where there is great irregularity of the inner surface of the bladder, it may be extremely difficult to get rid of the last fragment. I have experienced this frequently. The aspirator

is applied, and time after time the fragment clicks against the eye of the cannula, but, on introduction of the lithotrite, the fragment cannot be grasped. Great perseverance may be necessary, especially if the fragment be a broad, thin shell from the outer crust of a large stone. A manœuvre that I have found useful is to employ the suction force of the

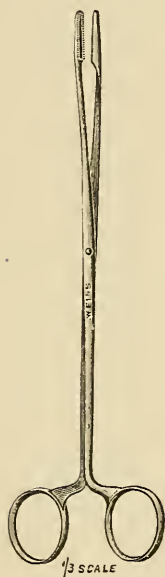


FIG. 29.



FIG. 30.



FIG. 31.

cannula and aspirator to bring the fragment out of the depression in which it lies, close to the neck of the bladder, and then to introduce the lithotrite and catch the fragment in this position. If the fragment lies in a depression behind the prostate, the forefinger may be introduced into the rectum. The lithotrite being in the bladder, the fragment of stone may now be pushed out of the depression in which it lies by the point of the finger, and caught by the lithotrite with a

little manipulation. This manœuvre, which I have frequently found successful, was suggested to me by my friend Surgeon-Major J. Blood, now of Birkenhead.

The larger the evacuating cannula, the less necessity there will be for crushing the calculus into fine powder, and, consequently, the less time will the operation require for its performance—a matter of no small importance when we have to deal with a large stone in a patient whose constitution has been very much worn by the disease. It is, therefore, advisable to employ the largest cannula that will pass with ease into the bladder. I cannot too strongly deprecate the use of any force in passing a catheter, or, indeed, any instrument, into the bladder; but the baneful effects which Sir Henry Thompson anticipated from the use of large instruments, experience has shown to be imaginary. Sir Henry says that the instruments should be proportionate to the size of the stone, but experience has taught me that the capacity of the urethral canal is of much more importance in determining the size of the instruments, and that the largest lithotrite and cannula that can be passed without the use of any force should be employed. A large lithotrite is much handier in the bladder, less liable to get clogged by débris, and much more efficient, not only for crushing large calculi, but for disposing of fragments of débris, than a small one; and I fully agree with Bigelow that when one gets accustomed to the use of a large lithotrite he does not willingly abandon it for a smaller instrument.

It will be absolutely necessary to have recourse to large instruments much more frequently in India than in this country, for the simple reason that the great majority of calculi are large when coming under observation in the former country.

As a rule, there ought to be little or no loss of blood attending the operation, with the exception of the trifling

bleeding that follows the incision in the floor of the urethra, when this is necessary to enlarge the *meatus*. I have frequently removed very large calculi with scarcely a tinge of blood in the washings from beginning to end. In some cases, however, the mucous membrane of the urethra is highly sensitive to the passage of instruments, and considerable bleeding takes place. In such cases I am in the habit of using a weak astringent in the washings—say, $\frac{1}{4}$ grain of acetate of lead to the ounce—and winding up the proceedings with a stronger solution.

The operation being completed, the patient should be put to bed, and well wrapped up in warm clothing. A morphia suppository should be at once introduced. In India I was in the habit of administering a large dose of quinine as soon as the patient recovered consciousness, and repeating the drug in smaller doses for a few days. I follow the same practice in England after all operations involving the passage of instruments through the urethra on patients who have lived in malarial climates. Such persons are particularly prone to fever after operations on the urinary organs, and there is no doubt that the judicious administration of quinine, combined with an opiate, has frequently the effect of warding off such attacks. The food for the first few days should be of a light kind, consisting mainly of milk and soups. A demulcent and alkaline drink should be allowed. My favourite mixture is a quart of barley-water, mixed with which are one drachm each of liquor potassæ and tinct. hyoseyami, and this the patient is encouraged to drink freely.

For the first twenty or thirty hours the urine may be tinged with blood, particularly till the operator has had large experience in this branch of surgery, and there will, as a rule, be considerable burning sensation along the course of the urethra, with some difficulty of micturition. The treatment indicated in the last paragraph will tend to alleviate these

symptoms. Should there be any pain or tenderness on pressure in the region of the bladder, hot fomentations, assiduously applied, followed by hot poultices to the hypogastric region, will be found soothing; and pain in the perineal region will be lessened by painting with extract of belladonna, after fomenting the parts.

Retention of urine is a rare sequel of the operation, for which a hot hip-bath will be found most effectual. Should this fail, recourse must be had to the catheter. More rare still is total suppression of urine, which should be dealt with on general medical principles. This occurs only in patients whose kidneys are diseased, and is of very grave import.

When the patient is the subject of atony of the bladder or enlargement of the prostate, it may be advisable to pass and tie in a soft catheter for a few days, to allow the water to flow in this way.

Acute inflammation of the testicle is a sequel of the operation that has from time to time occurred in my practice, and readily yielded to the ordinary treatment for that complication.

The most frequent sequel of the operation in India is the occurrence of fever. To the ordinary catheter or urethral fever, long recognized as attending the passage of instruments through the urethra, we have superadded, as it were, the effects of malaria; and the supervention of this fever is a contingency that will have to be reckoned with in a large proportion of the cases dealt with. The attack sets in, as a rule, a few hours after the operation, frequently after the first act of micturition, and passes through the usual stages—*cold*, *hot*, and *sweating*—of an ordinary attack of intermittent fever, from which it is scarcely to be distinguished. The treatment will also be the same as in ague—extra warm clothing, hot-water bottles to the extremities, and the administration of hot drinks, particularly tea, during the cold stage. As this passes

into the hot stage, part of the clothing must be removed, and the patient's thirst relieved by copious drinks of water, lemonade, etc. The ordinary fever mixture should also be given to encourage perspiration. When the sweating stage sets in, warm clothing must be again supplied to encourage perspiration, and prevent the patient catching cold. During the intermission quinine should be given. The fever is, as a rule, very amenable to treatment.

The operation is undoubtedly a difficult one, perhaps the most difficult in the whole range of operative surgery, and should not be lightly undertaken by inexperienced hands. There are some men whose hands were never made for the use of surgical instruments, and my advice to such is not to undertake this operation. There are other spheres in the medical profession of as much usefulness as this particular branch of operative surgery. In 1867 Sir William Fergusson, writing of lithotrity, said : 'I know not any process in surgery requiring more forethought, knowledge, manipulative skill, and after-judgment.' And if this remark of one of the most distinguished lithotritists of his day was true of the old operation of lithotrity, how much more is it applicable to the modern operation of litholapaxy, in which instruments of much larger size and greater power than formerly used are employed, in which calculi of much larger dimensions are attacked, and in which the proceedings are extended over much longer periods. Patience, perseverance, gentleness, dexterity, a light touch, and, above all, experience, are essential to make a man a good litholapaxist. I do not hesitate to say that on every occasion that I have performed the operation I have learnt something new. In this fact consists one of the great beauties of the operation, so far as the surgeon is concerned. It is always a field of novel research.

It has been said that no novice should undertake this

operation; and this is undoubtedly true so far as the great body of the profession at home is concerned, the majority of whom pass months, sometimes years, without undertaking an operation of any magnitude, and where the opportunities for operating for stone are so few. But the case is different in India. There are few officers of the Indian Medical Service, holding civil appointments, who do not reckon their major operations annually by the hundred, and in many instances by the thousand. During the past few years a healthy spirit of rivalry, as to the amount of good work done, has entered the ranks of the Service; and I do not hesitate to say that there are now many hospitals in India, where more operations are undertaken single-handed by the Civil Surgeon than by the whole staff in some of the largest London hospitals. It goes without saying that the large experience thus acquired must give to the surgeon practising in India a manipulative dexterity in the use of surgical instruments, an amount of self-reliance, boldness, and judgment in dealing with difficulties that unexpectedly arise, which can be rarely acquired elsewhere. This being the case, why should he hesitate to undertake litholapaxy, with such frequent opportunities of putting the operation into practice?

The beginner will do well to commence by operating on cases where the stone is small and the urethra capacious. As experience is acquired large calculi and those attended by complications are to be attacked.

Previous to undertaking the operation for the first time, it will be well, when possible, for the surgeon to pay a visit to one of those hospitals where the operation is performed. More information will be gained by seeing the operation once well performed than from any amount of reading and theoretical knowledge. It is not the object of this work to take the place of practical knowledge, but rather to assist and supplement it.

CHAPTER IV.

THE AUTHOR'S EXPERIENCE OF LITHOLAPAXY, WITH COGNATE STATISTICS.

IN the preceding pages I have endeavoured to give a clear and concise description of the operation of litholapaxy, and the instruments employed in its performance. Before proceeding to deal with the special difficulties and complications met with in this operation, and the peculiarities of its application to male children and females of all ages, it will be convenient, and tend to avoid repetition, if I now give the results of my own experience of the operation, with some cognate statistics.

My first lithotomy operation was performed on May 4, 1877, and since that time I have operated on 864 cases of stone in the bladder by all methods, viz.:

Perineal lithotomy	...	...	...	...	244
Suprapubic lithotomy	...	...	...	...	6
Vaginal lithotomy	...	...	...	...	1
Rapid dilatation of urethra in females	...	...	...	...	3
Litholapaxy	...	...	...	...	610
Total					864

Though for statistical purposes it will be necessary for me to deal comprehensively with the whole of my operations for stone in the bladder, it is to these latter 610 cases dealt with by Bigelow's method that I propose directing particular attention in this work, demonstrating thereby what a vast influence the modern operation has had in ameliorating the

sufferings and diminishing the mortality attendant on this painful disease.

Since performing my first litholapaxy operation, July 3, 1882, I have from time to time published papers in the medical journals* giving full details of several series of this operation performed by me. The great majority of these operations were done in hospital practice; and careful notes of every case have been kept by my assistant surgeons and myself. In a large proportion I have had the pleasure of operating in presence of one or more surgeons, and showing them the results. There was no selection of cases, my rule being to operate on every patient suffering from stone coming under my care, no matter in what condition. No case was allowed to leave hospital, or observation in case of private practice, till a cure had been effected. This monograph may therefore be accepted as an accurate and trustworthy record of work in this branch of surgery. It is hoped that such a record of a large number of cases of this operation from the practice of a single operator may prove interesting to the profession.

There were amongst these 610 cases of litholapaxy 439 adults—viz., 432 males and 7 females; and 171 children—viz., 165 males and 6 females.

The adults varied in age from 16 to 96 years, the average being $48\frac{1}{2}$; the children from $1\frac{1}{2}$ to under 16 years, the average being just 7.

The average number of days spent in hospital after the operation, or under treatment in case of private patients, was, in the case of adults, $6\frac{1}{2}$ days, the period varying from 2 to 28 days; in the case of children $5\frac{2}{3}$ days, varying from 2 to 31 days. I may mention, however, that in many instances

* *Indian Medical Gazette*, Dec. 1882, Feb. 1883, March 1884, April 1885, Jan. 1886, Feb. 1886; the *Lancet*, Feb. 28, March 7 and 14, 1885; *British Medical Journal*, Dec. 24, 1887; Oct. 12, 1889; May 9, 1891; July 16, 1894.

the patients were kept in hospital one, two, or three days longer than absolutely necessary, as a precautionary measure or for purposes of observation.

The débris of calculi removed varied in weight in adults from 2 grains to $6\frac{1}{8}$ ounces, the average weight being 262 grains; in children from $1\frac{1}{2}$ grains to 3 ounces and $2\frac{1}{4}$ drachms, the average being $95\frac{1}{3}$ grains. The weights here given are those of the débris when dried; and the specimens have all been preserved by me. There were 192 calculi weighing half an ounce and upwards; 90 one ounce and more; 31 two ounces and over; 8 three ounces and upwards, and 1 weighing $6\frac{1}{8}$ ounces.

These 610 operations occurred in 599 different individuals, the disease having recurred once in nine instances, and twice in one instance. In three other cases litholapaxy had been previously performed by other surgeons. In all these cases long intervals had elapsed between the first operation and the recurrence of the symptoms of stone; and, after careful inquiry, I am bound to say that neither in the cases of those previously operated on by myself nor in those operated on by others did the recurrence seem to be due to a fragment having been left behind at the first operation. They were all simple cases of recurrence of stone from constitutional causes. In eight other instances the patients had previously undergone lithotomy, three of them twice. Three of these lithotomy operations had been performed by myself. I attribute the rarity of recurrence of stone after litholapaxy in my practice to the extreme care exercised by me in seeing that the last fragments of calculus are removed. So far as my own experience goes, recurrence of stone is as frequent after lithotomy as after litholapaxy. Dr. Keegan informs me that this is also his experience of the two operations. I find, however, that Sir Henry Thompson's 850 cases—478 by lithotripsy, and 372 by litholapaxy, or 'lithotripsy at one sitting,'

as he calls it—occurred in 730 individuals,* there being thus no fewer than 120 'recurrent' operations for stone, or over 16 per cent. I shall have to refer to this later on.

The length of time occupied by the operation ranged from a couple of minutes to $2\frac{1}{2}$ hours. It will vary, of course, with the size and consistence of the stone, the capacity of the urethra, the facility with which the instruments can be introduced, and the experience and dexterity of the operator. I am now in the habit of crushing as much of the stone as possible before withdrawing the lithotrite, so that in most cases of stone of ordinary size only one introduction of this instrument is necessary. The repeated introductions of instruments should, I think, be avoided as much as possible. Rapidity of execution is a quality which comes with practice; and there is no doubt that, all undue haste and roughness of manipulation being avoided, it is desirable to complete the operation as rapidly as possible, particularly when the patient is old and much enfeebled by the disease.

The patients were, as a rule, anæsthetized during the operation. During the last three or four years I have, however, been performing the operation without an anæsthetic in an increasing number of suitable cases. With a capacious urethra in an adult I should not hesitate to attack a stone of about an ounce in weight without the aid of an anæsthetic, or with local anæsthesia by cocaine only, in a case in which the internal administration of an anæsthetic was undesirable, or strongly objected to by the patient.

Amongst these 610 litholapaxy operations there were many cases in which the calculous disorder was complicated by the co-existence of urethral stricture. Hypertrophy of the prostate was also present in a large proportion of cases. The methods of dealing with these troublesome complications will be fully dealt with later on.

* Introduction to 'Catalogue of Calculi, etc.,' Churchill, 1893.

Cystitis accompanied the calculous disorder in a large proportion of cases, and in many instances the urine was fetid. For this complication no special treatment is, as a rule, necessary, the removal of the stone, the cause of the cystitis, almost invariably resulting in its disappearance.

Many of the patients also suffered from enlargement of the spleen, dysentery, piles, prolapsus ani, and other diseases. In short, no case of stone coming under my care has been refused the benefit of operation, no matter in what state of health, some having been apparently moribund when placed on the operating table.

Under these circumstances I need scarcely add that kidney disease in all its stages was frequently present; but so far as the performance of litholapaxy goes I never desist from the operation on this account; for no matter what the state of the kidneys may be I perform the operation, knowing that it gives the best prospect of recovery. Contrast, in this respect, Bigelow's operation with the old operation of lithotrity, which was contra-indicated when kidney disease was present!

Amongst these 610 litholapaxy cases there were 11 deaths, viz., 9 amongst 439 operations on adults, and 2 amongst 171 on children. These fatal cases, with the exception of the last two, have been fully reported in the medical journals already referred to; and the details of the remaining two will be given in due course. The causes of death were: exhaustion, 5 (with pneumonia superadded in 1); peritonitis, 2; pyæmia, 1; acute nephritis, 1; and acute cystitis, 2. All these cases were in bad health when coming under operation except one; and this patient had had retention of urine for thirty-six hours, with the calculus blocking the prostatic urethra. The kidneys were diseased in several of these cases, particularly in one, from whom I removed $3\frac{1}{4}$ ounces of oxalate of lime-stone, and in the case which died from acute nephritis. In this

latter I found at the autopsy two calculi in the right kidney, weighing 2 drachms. One patient was ninety years of age. One, a child of thirteen years, who died of cystitis, had been roughly sounded a week before coming under my care, since which time he had been in great agony, so that probably the bladder had been injured during the sounding.

The 11 deaths in 610 litholapaxy operations—viz., 439 adults with 9 deaths, and 171 children with 2 deaths—give a mortality of 1·80 per cent. on the whole, or about 2 per cent. in adults and 1·17 per cent. in children. There were, on the other hand, 254 lithotomies in my practice with 11 deaths—viz., 54 adults with 10 deaths, and 200 children with 1 death—giving a mortality of $4\frac{1}{3}$ per cent. on the whole, or $18\frac{1}{2}$ per cent. in adults, with $\frac{1}{2}$ per cent. in children.

This is, however, not a fair method of comparing the results of the two operations, as, since the introduction of litholapaxy into my practice, only those patients that were unsuitable for this operation were subjected to lithotomy. Previous to my commencing to operate by litholapaxy I had done 94 lithotomies, of which 33 were in the adult with 6 deaths, or a mortality of 18 per cent., there being no deaths amongst children. Since then I have performed 770 operations in all with 16 deaths, or about 2 per cent.—viz., 460 in the adult (439 litholapaxies with 9 deaths, and 21 lithotomies with 4 deaths) with 13 deaths, or less than 3 per cent.; and 310 in children (171 litholapaxies with 2 deaths, and 139 lithotomies with 1 death) with 3 deaths, or about 1 per cent. This is the proper method of comparing the results of the two operations; and, setting aside the results in children, in whom lithotomy has always been a comparatively successful operation, it will be observed that the introduction of litholapaxy into my practice has had the effect of reducing the mortality in operations for stone *in the adult* from 18 to 3 per cent.

I may point out that though I have been singularly

fortunate in my lithotomy cases in children, the mortality attending this operation in the adult in my hands approximates pretty closely to that recorded in hospital practice both in England and India. Thus, Sir Henry Thompson has collected details of 1,827 lithotomies performed in British hospitals previous to the introduction of litholapaxy, showing 229 deaths, or $12\frac{1}{2}$ per cent. There were 1,028 children with 68 deaths, or $6\frac{1}{2}$ per cent., and 799 adults with 161 deaths, or 20 per cent. In an article in the *Lancet*, March, 1885, I gave the statistics of 2,592 lithotomy operations performed in Indian hospitals in 1882, showing a mortality of about 13 per cent. on the whole—practically the same as in British hospitals.

When I commenced to perform litholapaxy in 1882, I at first adopted this operation in selected cases in the adult only, relegating the difficult cases to lithotomy; then, as I gained experience, extending it to most of my adult cases. Then in 1886, influenced by Keegan's results, I extended the operation to male children. I have now practically abandoned lithotomy in my practice in favour of litholapaxy, the force of which remark will be seen when I state that amongst the last 300 cases of stone operated on by me in patients of all ages from 2 to 90 years, the calculi weighing from 2 grains to $6\frac{1}{8}$ ounces, there were only 6 lithotomies (1 supra-pubic, 4 perineal and 1 vaginal), the modern operation having been found feasible in all the other 294 cases. In 1890 I had 106 cases of stone under my care, and they were one and all treated by litholapaxy, with one death. With results such as these I have not felt inclined to follow the lead of Sir Henry Thompson in his attempt to revive the operation of supra-pubic lithotomy in cases of large calculi when I could deal with them by litholapaxy, nor of his somewhat rash imitators who adopt the supra-pubic operation in case of small stones. I do not think that we can expect to improve on the results above indicated

whilst we continue to extend the operation of litholapaxy to all patients coming under our care, no matter in what condition, even to apparently hopeless cases. They are, indeed, results unequalled, I venture to say, in any other large and important operation in surgery, and entirely due to the introduction of Bigelow's method of operating.

CHAPTER V.

DIFFICULTIES AND COMPLICATIONS: ILLUSTRATIVE CASES.

Large Calculi.—With a capacious urethra in an adult male, there being no enlargement of the prostate, and the bladder being roomy and non-sacculated, the experienced litholapaxist should have no difficulty in disposing of a stone of moderate dimensions—say, under 2 ounces in weight. When, however, the stone, if at all a hard one, exceeds this weight, the operation becomes a much more serious and difficult one. I find that amongst my series of 610 litholapaxy cases there were 31 weighing 2 ounces and upward, eight 3 ounces or over, and one $6\frac{1}{8}$ ounces. The following table shows at a glance the particulars of these operations, which were all undertaken on male patients :

<i>Serial No.</i>	<i>Date of Operation.</i>	<i>Age.</i>	<i>Weight of Calculus.</i>	<i>Variety.</i>	<i>Result.</i>
			oz. drs. grs.		
16	Dec. 6, 1882	60	3 2 0	Uric	Successful.
42	May 15, 1883	18	2 4 0	Carb. lime	"
44	May 25, "	45	2 6 0	Uric	Died.
70	Nov. 21, "	80	2 0 55	"	Successful.
91	June 21, 1884	35	2 0 0	Phosphates	"
97	Aug. 13, "	26	3 1 30	Oxalates of lime	Died.
111	Oct. 26, "	55	2 0 45	Uric, oxalate	Successful.
123	Aug. 30, 1885	60	3 2 30	Uric	"
126	Sept. 9, "	55	2 2 0	"	"
136	Aug. 23, 1886	50	2 0 0	Carb. lime	"
189	May 27, 1887	24	2 1 0	Urates	"
199	July 6, "	30	2 4 0	Uric	"
251	May 5, 1888	44	2 1 50	"	"

Serial No.	Date of Operation.	Age.	Weight of Calculus.			Variety.	Result.
			oz.	drs.	grs.		
303	March 25, 1889	55	2	6	0	Uric	Successful.
318	June 3, "	90	2	0	39	"	Died.
350	Dec. 26, "	15	3	2	17	Urates, Phosph.	Successful.
371	March 4, 1890	55	2	6	10	Uric	"
374	March 21, "	80	2	4	37	Urates	"
379	April 15, "	75	3	1	0	Uric	"
414	July 30, "	35	2	4	19	"	"
421	Sept. 6, "	80	2	4	18	"	"
433	Oct. 20, "	70	2	0	39	"	"
458	Jan. 2, 1891	20	3	0	0	Phosphates	"
476	March 19, 1891	20	2	0	4	Urates	"
507	Jan. 7, 1892	75	2	0	1	"	"
517	Feb. 20, "	45	6	1	0	Phosph. of lime, uric	"
523	March 19, 1892	50	2	0	2	Phosphates	"
552	Sept. 24, "	58	3	0	10	Uric	"
580	Feb. 13, 1893	65	2	0	50	"	"
587	Feb. 28, "	60	2	2	40	Oxalate of lime	"
607	March 3, 1895	57	2	0	53	Phosphates	"

The removal of large calculi of these sizes demands much patience, perseverance, skilful manipulation, and manual labour. It is, indeed, no light or easy task, and will be found to call forth all the resources of the surgeon. Before attacking a stone of 2 ounces and upwards by the modern operation, a surgeon should have had a considerable experience in dealing with smaller calculi. The chief difficulties met with and the means by which they may be overcome, are well illustrated in the following cases, as also in Case 379, recorded in connection with the complication of enlarged prostate :

Case 16.—I. B., aged 60, admitted into the Moradabad Civil Hospital, December 3, 1882, with all the symptoms of stone in the bladder, which had existed eleven years. The patient could only pass urine in drops continuously throughout the day and night, and its passage was attended with great pain. His penis and foreskin were hypertrophied from the patient's constantly rubbing the organ to relieve the pain and irritation. A urethral calculus was felt in the *fossa navicularis*. When the patient tried to pass urine he had to rub and pull the penis, and in this way push the urine past the calculus in the urethra. The urine was mixed with pus and blood. The fæces passed were ribbon-shaped, due to pressure of

the stone on the rectum. On passing the finger into the rectum, a large stone could be felt in the bladder. The patient's health was very bad. He was pale, thin, weak, and anæmic, and he had a pinched, anxious expression, the result of long suffering. On December 6 I performed litholapaxy, the urethral calculus having first been removed after slitting the floor of the *meatus*. The operation lasted sixty-six minutes, and the débris weighed $3\frac{1}{4}$ ounces, the calculus being a hard uric-acid one. Considerable trouble was at first experienced in grasping the stone, owing to the contraction of the walls of the bladder on it. This was obviated by injecting water into the bladder. The lithotrite was introduced at least a dozen times, and after each crushing a large quantity of débris was washed out through a No. 18 cannula. With the exception of slight pain in micturition during the first day or two, the patient had no after-trouble. He made a rapid recovery, and on December 15, when discharged from the hospital, the following entry in my note-book describes his condition: 'Patient now rid of all bladder symptoms. Urine quite clear; bladder retains a large quantity at a time. Has grown fat and strong. Says he has not been so well for several years. This man was a miserable creature on admission to hospital ten days ago, and now leaves it in excellent health.'

Case 123.—A male, aged 60, admitted into the Mussoorie Hospital, August 29, 1885, with symptoms of stone. The patient stated that the symptoms had existed thirty years, but that they were extremely aggravated during the last three years. He was very weak and emaciated, and scarcely able to stand up. He agreed to an operation, provided that it should not be a cutting one. On August 30 I performed litholapaxy, Surgeon-Major W. Murphy and Surgeons A. Kavenagh and C. R. Tyrrell being present. Chloroform was given by Dr. Tyrrell. A large sound, No. 14, was first passed with ease, after slitting the floor of the *meatus* slightly. I then attempted to pass the largest lithotrite, but its beak was arrested by a pouched condition of the urethra near the neck of the bladder. The medium-sized and smaller lithotrites were then tried, but with a similar result. Time after time the large steel sounds were passed easily, but any sized lithotrite I failed to introduce. Eventually, after no less than twenty-five minutes had been wasted in the attempts to pass the lithotrites, a medium-sized one was passed successfully. This was accomplished by passing the instrument as far as the part at which the hitch took place, then depressing the handle between the thighs and pushing the instrument on with a rotatory motion in the direction of the axis of the body. The medium-sized lithotrite could not close on the stone, so it was withdrawn, and the large lithotrite then easily passed. But the stone could not be grasped, owing to the walls of the bladder contracting on it. It was therefore withdrawn, and 4 or 5 ounces of water introduced

by means of the aspirator and cannula. The stone was then caught by the large lithotrite, which failed to lock, owing to the large size of the stone. The long diameter of the stone was then changed for a shorter one, when it was found that the lithotrite locked with ease. The calculus was extremely hard and tough, and required all the force I was capable of to crush both it and the fragments. The lithotrite had to be introduced several times, and the evacuating catheter, No. 18, as often, before the whole of the stone was removed. The fragments weighed 3 ounces $2\frac{1}{2}$ drachms. The operation lasted one hour in all, of which twenty-five minutes were wasted in unsuccessful attempts to introduce the lithotrites at first. Once the stone was grasped, the large lithotrite soon disposed of it. There was considerable bleeding from the urethra during the early manipulations, though great care was taken to use no force. After the operation the patient was extremely weak and almost pulseless. On consciousness returning, stimulants were given, and the usual after-treatment had recourse to. The stone was partly uric acid and partly oxalate of lime. August 31: Patient passed a good night; says that he has not had such a good night's rest for thirty years! Urine passed freely, with some pain, and blood-stained. On September 1 there was some pain and tenderness in the region of the bladder, which, however, yielded to hot fomentations. The patient's temperature never went above 100° F. He suffered for a few days from a discharge of pus, which came from the prostatic portion of the urethra. The patient put on flesh, and was discharged cured on September 24, though for several days previously he was walking about the hospital inclosure.

Case 517.—The patient was a male, aged 45, with symptoms of stone lasting twelve years. He was in wretched health, the urine being muco-purulent and fetid. The operation was performed on February 20, 1892, Surgeon-Major Tuohy being present. When placing the patient on the operating-table, I imagined that supra-pubic lithotomy would be necessary, but determined to try litholapaxy. Introducing my largest lithotrite, after some manipulation I caught a portion of the stone (which I found was irregular in shape), broke it off, and reduced it to fine fragments. This process I repeated again and again, chipping off portions, or scraping the sides of the stone, till I had removed about three ounces of débris. I then found that the main body of the stone was lying in a wide-mouthed pouch at the posterior part of the bladder. After some difficulty I grasped the stone in this position, but could not move it from the sac into the main cavity of the bladder. After much effort I crushed the stone *in situ*, and then pulverized the fragments one by one, some in the pouch, and some in the general cavity of the bladder. The central portion of the stone, $1\frac{1}{2}$ inches in diameter, was so extremely hard that several of my most powerful efforts with the lithotrite were necessary

before it was crushed. The operation lasted two hours, during which $3\frac{1}{4}$ ounces of chloroform were used. A small pedunculated tumour the size of a small cherry was brought away by the lithotrite during the operation. The patient was much exhausted after the operation, but soon picked up strength. Surgeon-Major Seymour saw him with me on February 24, when he was sitting up in bed; and on March 9 he was free from urinary symptoms, but weak. On June 18 Dr. Seymour, who took charge of my work during my holiday, wrote me: 'That man from whom you removed that enormous stone came to show himself the other day. The last time I saw him he came in a dooly, looking like an old man of 70. Now he looks a fairly robust man of 40. I would not have believed such a change possible. He is able to walk as well as ever.' One year after the operation, February 21, 1893, this man appeared before me in hospital in perfect health. He informed me that his wife had presented him with a daughter one month previously, though he had lost all sexual power for several years before the operation.

By the process of chipping and scraping above indicated, and fully described later on, large calculi can be reduced to such a size that they can be caught and crushed by a lithotrite which would not originally lock on them. In this way I have crushed successfully in a lad of fifteen years a stone weighing more than $3\frac{1}{4}$ ounces by a No. 9 lithotrite. The amount of manual labour required for dealing with these large calculi is excessive. My hands were often blistered and my arms frequently ached for days after performing litholapaxy in one of these cases. Great patience will be required in the various manipulations before the stone is caught. As a rule, when the stone is large, the walls of the bladder hug it closely, so that the manœuvre referred to in these cases, of injecting water to separate the walls of the bladder from the stone, must be had recourse to before the stone can be grasped by the lithotrite. It will sometimes be found, also, in dealing with large calculi, that though the lithotrite will not lock should the stone be first grasped by the long axis, it will do so if this is changed for the short axis of the stone. This manœuvre should always be tried before abandoning the case as unsuitable for litholapaxy. And here I may mention that

experience has taught me that, as a rule, a stone lies in the bladder with its long axis in the antero-posterior direction.

There is no point on which I have laid more stress in my published writings on this subject than the absolute necessity of completing the operation at a single sitting, no matter how large the stone may be. This is the essential feature of the operation. Amongst my 610 operations, in eight instances only was it necessary to have recourse to a second sitting, and in two cases only designedly so—that of a boy fifteen years old, from whom I removed successfully a stone (or rather two stones), the débris of which weighed $3\frac{1}{2}$ ounces, the details of which will be given later on; the other, that of a man aged forty-five, with a large calculus, 3 ounces in weight. After removing 2 ounces of débris, I had to postpone finishing the operation to a second sitting, owing to the extreme exhaustion of the patient. In this case a fatal result ensued from pyæmia. In the remaining six instances a fragment was undesignedly left behind at the first sitting, revealing its presence next day by the pain, stoppage of urine, and other symptoms, when it was removed at a second sitting.

Encysted Calculi.—The manner in which the main portion of the calculus referred to in Case 517, which lay in a pouch, was disposed of, naturally leads one on to the consideration of encysted calculus of the bladder. In a paper* which I read at the International Medical Congress at Rome, in 1894, I called the attention of the profession to this subject. Previously such cases had, by general consensus of opinion, been relegated to supra-pubic lithotomy; and I am unaware of any published writings in which dealing with them by litholapaxy had been advocated. When the opening into the sac in which the stone lies is narrow, or when the stone almost fills the pouch, it will be necessary to have recourse to cystotomy; but, so far as my experience goes, such cases are

* *British Medical Journal*, June 16, 1894.

rare, the stone as a rule lying loosely in a wide-mouthed pouch. For several years I have now been in the habit of dealing with encysted calculi mostly by litholapaxy, withdrawing the stone into the general cavity of the bladder when possible and crushing it there; otherwise crushing it in the sac. Though limits of space will not permit of my dealing exhaustively with this subject here, I will venture to give two typical examples:

Case 513.—January 30, 1892, a male, aged 60, admitted to hospital with symptoms of stone of three years' duration. These had commenced with severe kidney colic. The patient was so weak and in such pain that he could not leave his bed. Passing blood and pus in the urine. Dysentery and piles also present. On January 31 I performed litholapaxy. The stone was felt to be a large one, lying in a sac on the right side of the bladder, about the position of the ureteral orifice. It was found impossible at first to grasp the stone, owing to the walls of the sac hugging it rather tightly. By injecting water into the bladder by the aspirator this difficulty was overcome, the stone being caught by the lithotrite in the sac. I tried to withdraw it into the bladder, but this could not be effected owing to the neck of the pouch being too narrow; so the stone was crushed *in situ*. After this the fragments were crushed, some in the sac and some in the general cavity of the bladder. No. 15 lithotrite and No. 18 cannula were introduced several times before the whole of the débris, which weighed 705 grains, was removed. The stone was mainly phosphatic. After the calculus had been removed I made a survey of the sac by means of the lithotrite. It appeared to be egg-shaped, with smooth walls. The opening into the bladder was circular, with a sharp, smooth, well-defined edge, and $1\frac{1}{4}$ inches in diameter. The depth of the sac as felt by the lithotrite was $3\frac{1}{2}$ inches. The day after the operation the patient was sitting up in bed, free from pain and passing urine freely. He said he had not felt so well for two years. He made a rapid recovery, and was discharged on February 6.

Case 557.—K. B., male, aged 55, admitted to Moradabad Hospital September 20, 1892, with stone of three years' standing. In terrible pain; passing pus and blood with urine; prolapse of the bowel takes place from straining; very thin and anæmic. On the 22nd I performed litholapaxy. Lithotrite No. 15 passed with difficulty, owing to the stone lying close to the neck of bladder. On opening its jaws a second stone was found further back. This was easily crushed and washed out. It consisted of white phosphates; weight, 317 grains. I then tried to catch the second stone

lying near the neck of the bladder, but failed to do so. No. 16 cannula was then passed as far as the stone, which seemed to be partly in the prostatic urethra, and water injected from the aspirator with force, but I could not dislodge the stone backwards. I now introduced a No. 8 child's lithotrite, and, holding it perpendicularly, after some manipulation caught the stone, which I found was encysted in a diverticulum, formed, as I imagined, partly by the trigone and partly by the posterior portion of the base of the prostatic urethra. The stone was $1\frac{1}{4}$ inches in diameter, so the lithotrite would not lock. I then substituted a No. 10 lithotrite, with which I crushed the stone *in the sac* into large fragments. A No. 16 cannula was next introduced, its end placed in the sac, and a large portion of débris removed by the aspirator. Some large fragments were driven by the inward current out of the sac into the main portion of the bladder. Here they were crushed by the lithotrite, some further fragments being crushed in the pouch. On opening the jaws of the lithotrite in the pouch it was found to be $1\frac{3}{4}$ inches in diameter. During the operation I passed my finger into the rectum and felt the stone in the pouch quite plainly. This second stone was of dark urates, and weighed 180 grains. Time occupied by operation, 55 minutes. Patient had much scalding for a few days, with an attack of cystitis, which was treated by washing out the bladder and injecting astringents. The urine was clear on October 1, and the patient was discharged cured on October 5.

Urethral Stricture.—Of all the complications met with in the treatment of stone by litholapaxy, the most difficult to deal with is perhaps the presence of organic stricture of the urethra. To permit of the large instruments employed in this operation passing through the urethral canal, the stricture must first of all be disposed of. This will be accomplished by either internal urethrotomy or dilatation, according to the nature of the stricture. If the case be one suitable for dilatation—that is to say, if the stricture be soft, elastic, and dilatable—this is best done by passing rapidly in succession a series of conical steel sounds (Fig. 28) two or three sizes larger at the bend than at the point, till the canal is sufficiently dilated, and then at once introducing the lithotrite and disposing of the stone. If the stricture be tight, but dilatable, it will be well to commence its dilatation a couple of days before the operation, by tying in gum-elastic catheters of successively larger sizes

till No. 8 or 10 is reached, and then, on the day of the operation, completing the dilatation by large conical steel sounds rapidly passed in succession. If, however, the stricture be



FIG. 32.

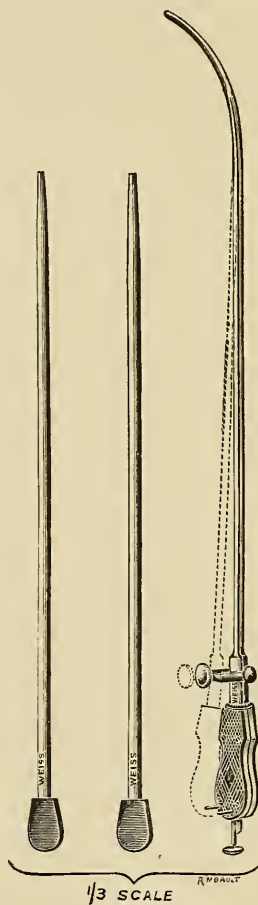


FIG. 33.

hard, cartilaginous, and non-dilatable, it must be dealt with by internal urethrotomy immediately before the operation for the stone. The variety of urethrotomy which I almost invariably perform is that known as Civiale's, in which the

stricture is cut from behind forwards; and the form of urethrotome, Thompson's modification of Civiale's instrument (Fig. 32). I cut thoroughly through the morbid tissue, and am not satisfied till, on withdrawal of the urethrotome, a solid steel sound of No. 16 or 18 (English) passes easily into the bladder without the use of any force. Holt's dilator (Fig. 33) was formerly much employed for bursting strictures of this nature, and there are still some surgeons who cling to this instrument; but I merely refer to it to condemn it as unscientific and dangerous, frequently bursting the healthy canal instead of the stricture. I have for many years abandoned this method in favour of that by internal urethrotomy.

The following illustrative cases will show the manner in which this complication may be successfully dealt with:

Case 51.—A male, aged 65, admitted July 5, 1883, with symptoms of stone, the presence of which was confirmed by the sound. The symptoms had existed three years, and the patient was extremely weak. He was carried to hospital in a bed; unable to stand or even sit up without aid. There was excruciating pain in passing water. He had to pass urine every half hour or so, only a small portion coming away at a time. The urine was blood-stained, and mixed with pus and shreds of lymph. Much albumen present. On passing the sound it was ascertained that there were two strictures present, one an inch behind the glans, and the other 4 inches from the *meatus*, through which a No. 6 sound only would pass. The patient was suffering from fever, and so extremely weak that I was afraid to undertake any operation; admitted to hospital and placed under preliminary treatment. On July 8 there was very little improvement, and I determined to operate. The patient being anæsthetized, the first stricture was divided by means of a long narrow scalpel passed along a director, and the *meatus*, which was narrow, cut at the same time. The deep stricture was then cut by means of the urethrotome. A full-sized lithotrite was then passed, the stone caught and crushed, and the débris removed through a No. 18 cannula, which was passed without difficulty. The stone, which was uric acid, weighed $1\frac{1}{2}$ drachms. The bladder felt sacculated, and a large quantity of filthy pus and flakes of lymph was brought away by the aspirator with the fragments of stone. The operation lasted only ten minutes. A full-sized gum-elastic catheter was then tied in. July 9: Patient very weak; suffered from high fever last evening; urine blood-stained and mixed with pus. [July 10: Fever again last night;

very weak, and wanders in his conversation. July 11: No fever; patient much better, sitting up in bed; urine clear; catheter removed. From this time convalescence was rapid, and he was walking about on July 14. Discharged cured on July 20.

Case 105.—Male, aged 50, admitted into the Bareilly Hospital September 10, 1884, with symptoms of stone, which had existed four months. Micturition very painful and difficult, and frequent stoppage of water. A small sound passed, and stricture detected at the membranous portion of the urethra. The patient being chloroformed, internal urethrotomy was performed. A medium-sized lithotrite was passed, and the stone crushed. The débris was removed through a No. 14 cannula, and weighed 15 grains only. A gum-elastic catheter tied in. The patient made a rapid recovery, and was discharged cured November 16.

Case 114.—A male, aged 45, admitted into the Bareilly Civil Hospital, October 31, 1884, suffering from symptoms of stone, which had existed one year. On passing a sound, a small stone was felt, and the urethra was found contracted at the membranous portion, admitting a No. 10 sound with difficulty. Patient anæsthetized, and a series of sounds from No. 10 to No. 16 passed rapidly one after another. A medium-sized lithotrite was then passed easily, and the stone caught and crushed. The calculus was mixed, partly uric acid and partly oxalate of lime; fragments weighed 1 drachm and 20 grains. Cannula No. 14 used. Evening: Patient in great pain; passing urine by means of catheter only, which was three times introduced by my Assistant-Surgeon, and eventually a gum-elastic catheter tied in. Poultices to the hypogastrium, and hot fomentations. Dover's powder, 10 grains, internally. November 1: No pain; passing water freely through the catheter; no fever. Patient rapidly recovered, and was discharged on November 12.

Case 281.—C. H., admitted November 7, 1888, with stone in the bladder and stricture of the urethra, the latter of several years' duration. Health extremely bad, a mere skeleton, in fact, and so weak that he could not leave his bed. Two strictures, one at the orifice of the urethra, extending 2 inches backwards, and a second $4\frac{1}{2}$ inches from the orifice, admitting a No. 5 metal sound, by which the stone was felt in the bladder. Patient put under preparatory treatment, and on November 11 a No. 5 soft catheter tied in. Next day both strictures were fully divided by the urethrotome, and a No. 15 steel sound at once passed. The lithotrite was then introduced, the stone crushed, and evacuated through a No. 14 cannula. The calculus was phosphatic—weight, 122 grains. The patient made an uninterrupted recovery. On the 14th he was sitting up in bed, on the 16th a No. 14 steel sound was passed, and on the 18th he was discharged cured.

Case 598.—This patient was operated on by me on March 9, 1894, in presence of the students in one of the large London hospitals, by kind invitation of one of the surgeons on the staff. A male, aged 45, suffering from stone and double stricture of the urethra, the latter having existed several years. Both strictures being dilatable, conical steel sounds were passed rapidly in succession up to No. 12 English. The only larger sound available was a No. 15, which would not pass. No. 10 lithotrite was introduced, but after several unsuccessful attempts to crush the stone, it was withdrawn. After some manipulation I managed to push the No. 15 sound through the strictures. A No. 14 lithotrite was then passed, the stone crushed, and the débris removed through a No. 14 cannula. The patient made a rapid and uninterrupted recovery. This patient appeared at the same hospital a couple of months ago, when he was found to be free from stone and stricture.

Hypertrophied Prostate. — Enlargement of the prostate is a complication which, contrary to what might be expected, as a rule offers little obstruction to the performance of litholapaxy. In passing the instruments over the enlarged prostate a little extra manipulation may be necessary, and this can only be learnt with practice. When obstruction is met with at the prostatic portion of the urethra, I find the manipulation of depressing the handle of the lithotrite between the thighs, and pushing it on with a slight rotatory, or boring, motion in the direction of the axis of the body, frequently successful in entering the bladder. Should this fail, it will be necessary for the surgeon to change the right side of the patient for the left, and, by means of the forefinger of the left hand in the rectum, holding the lithotrite in the right, endeavour to guide the point of the instrument over the obstruction into the bladder.

When considerable hypertrophy of the prostate exists, and particularly when the middle lobe is enlarged, owing to its projection into the bladder, there is naturally a pouch formed between the posterior surface of this organ and the base and posterior wall of the bladder. It is in this pouch that, as a rule, the stone lies, and, in order to catch it there, it will frequently be necessary to turn the jaws of the lithotrite round

so as to point downwards, and then open them in this position, when, by a little manipulation, the stone, and subsequently its fragments, will be caught.

When the enlargement of the prostate is accompanied by atony of the bladder, care must be taken to draw the urine off three or four times daily after the operation by means of a catheter, or a soft rubber catheter may be tied in and the urine allowed to flow by this for a few days.

There is generally a good deal of bleeding during the performance of litholapaxy when the prostate is enlarged. It is necessary in such cases to exercise great care in removing the last fragments, for they frequently get embedded in clots of blood in the bladder, which have to be broken up by frequent washings by the aspirator, and then removed with the entangled débris of stone.

The following cases illustrate some of the difficulties met with, as also the after-treatment. Case 123, already given under the head of 'Large Calculi,' also illustrates some of the difficulties arising from enlarged prostate, as well as the means by which they may be overcome.

Case 34.—A mason, aged 85, admitted April 15, 1883, with symptoms of stone, which had existed two years. There was great pain in passing urine, which came away in small quantities at a time, frequently repeated. On passing a sound, the presence of a stone was confirmed, and the existence of a greatly enlarged prostate also ascertained. On passing a catheter, a large quantity of residual urine was drawn off. The patient was emaciated, extremely feeble, and almost in a dying state. Still, he was at once anæsthetized, and litholapaxy performed. There was considerable difficulty at first experienced in passing the lithotrite over the prostate. This was obviated by passing the instrument on the left side, with the finger in the rectum as a guide. The operation lasted twenty minutes, during which $6\frac{3}{4}$ drachms of a very hard uric-acid calculus were removed. The lithotrite had to be introduced four times, and a No. 16 catheter as often. Evening: Retention of urine; catheter passed and water drawn off; patient suffering from high fever, very weak. 16th: Fever less; retention of urine continues; catheter passed every six hours. 19th: On passing the catheter it grated against a fragment of stone. Chloroform

given, and the fragment crushed and evacuated by the aspirator; weight 40 grains. From this time the patient made a rapid recovery, putting on flesh and picking up strength, and was discharged cured of stone on April 26.

Case 379.—R. B., aged 75, admitted to the Moradabad Hospital, April 14, 1890, with large stone of six years' standing. Extremely weak and in great pain; passing urine every fifteen minutes, frequently mixed with blood. Prostate much enlarged. Litholapaxy performed April 15. I introduced my largest lithotrite, No. 18, and at once caught the stone, but found I could make no impression on it. Eventually one end of the stone, which was oval, was caught, and with a great effort broken off. This was then reduced to débris, and removed by the aspirator. This process was repeated again and again till the whole stone was disposed of. There was considerable bleeding during the operation from the enlarged prostate, but the patient bore the operation, which lasted an hour and a quarter, well. The débris was that of an oxalate of limestone, and weighed $3\frac{1}{8}$ ounces. Evening: Patient wonderfully well; passing urine freely, slightly coloured with blood. No fever; slight pain in the perineum, relieved by hot fomentations. Next day the urine was clear. April 20: Walking about, free from all urinary symptoms. Discharged April 27, in excellent health.

Recent Case.—F. H., aged 54, patient of Dr. Macnaughton Jones, of Harley Street, with whom I saw the case in consultation, April 21, 1896. Suffering for four years from kidney colic, gravel, and bloody urine, for which he went to Contrexéville on three different occasions, each time with temporary relief. About a year ago, in rushing down hill to catch a train, felt something disturbed in his bladder. Next day passed bloody urine and a substance 'resembling a mixture of chocolate and mortar.' Ever since has had difficulty of micturition, with twisted stream and sense of obstruction at the neck of bladder. Has passed large quantities of blood during past four months. There is great irritability of bladder; urine passed every hour. Pain before, during, but especially after micturition. Urine contains much blood and thick stringy mucus. Prostate much enlarged; Coudée catheter passed four times daily for some months. Patient writes: 'The last two or three weeks life has been a torment. Could not rise from seat without desire to make water. Could make only a small quantity, then stoppage, and then only in spurts, finishing with severe cutting and twisting pains.' Dr. Macnaughton Jones diagnosed a stone in the bladder, the presence of which was confirmed at our consultation. On April 25 I performed litholapaxy, Dr. Macnaughton Jones being present and Dr. Dudley Buxton giving ether. No. 15 lithotrite was passed with great ease as far as the prostate, where some manipulation was necessary to enter the bladder. The stone, which lay in a pouch, or bed,

formed behind the prostate, was quickly grasped (measuring $1\frac{1}{2}$ inches) and crushed, and the débris removed through a No. 16 cannula. The stone was moderately hard, consisting mainly of phosphate of lime with uric nucleus; weight 344 grains. The bladder was extremely narrow, contracted, with thick, rough, rigid walls. Instruments twice introduced, operation lasting fifteen minutes. Some bleeding from the prostate; the washings brought away much filthy mucus and thick flakes of lymph with the débris of stone. The patient had not one bad symptom, and made a rapid recovery, being dressed and walking about his room on April 27, two days after operation! The patient's progress may best be given in his own words, written on April 30: 'No after pains or inconvenience whatever. Second day after operation water became clearer, and third day quite clear. Can now retain water in a normal manner day and night. Was in bed two days by doctor's wish, though feeling no necessity for it, and had at no time any sensations reminding me of operation.' On April 30 I examined the prostate, and found that it had greatly diminished in size, thus illustrating what I have frequently verified in my practice—that the presence of a stone in the bladder will often cause congestive or inflammatory turgescence of an already enlarged prostate, which quickly subsides if the stone, the source of irritation, be completely removed. On May 1 the patient went for a long walk, and next day returned to his business in the City.

I had the pleasure of showing this case to some well-known surgeons, who expressed surprise at the rapidity of the cure. The case was a typical example of stone complicated with enlargement of the prostate, chronic cystitis, and contracted, irregular bladder with thickened, rigid walls, giving little room for the manipulation of instruments, which some of my London surgical friends think a peculiar feature in English practice, but which I can assure them in no way differs from similar cases in one's practice in India. I was pleased to meet with a complicated case of this kind thus early in my London career; and whether regard be had to the difficulties encountered, the ease with which they were overcome, or the rapidity of the cure, I shall have no objection to meeting with many such cases.

We must not expect, however, to be successful in performing litholapaxy in every case in which hypertrophy of the prostate occurs in connection with stone in the bladder. It will occasionally be found that, even when a large steel sound can be passed readily into the bladder in such cases, no amount of manipulation will enable us to pass a lithotrite, with its sharply curved beak. The use of force of any kind in passing

instruments in such cases must be carefully avoided; and if the lithotrite cannot be coaxed in by that amount of manipulative skill which the surgeon from his experience has acquired, the idea of performing litholapaxy must be abandoned, and supra-pubic or perineal lithotomy had recourse to, according to the circumstances of the case.

I may mention here that hypertrophy of the prostate occurs at a much earlier age amongst natives of India than amongst Europeans, being frequently found amongst them as early as 45 years. But then it must be recognized that the expectation of life is at least ten years less amongst Asiatics than amongst Europeans, and that a native of India is comparatively as old at 45 as a European at 55.

Partially Impacted Calculus.—A difficulty is sometimes met with, both in passing the instruments and catching the stone, when the calculus lies stationary, growing partly in the bladder and partly in the prostatic portion of the urethra. From one's experience of lithotomy, the difficulty of managing such cases may be easily imagined. Every lithotomist of any experience must have come across cases in which an irregular, elongated calculus lies with its main portion, or body, in the bladder, and a small elongated head in the prostatic urethra, the two portions being united by a neck corresponding with the vesical orifice of the urethra. Such a calculus must, if possible, be displaced from its position backwards into the bladder before being crushed, otherwise lithotomy will have to be performed. The manner of dealing with such calculi will be best illustrated by a case from actual practice :

Case 121.—This case I saw in consultation with Surgeon-Major Fasken, at Dehra Doon, with whose kind permission I performed litholapaxy. A Hindoo, aged 32, admitted March 17, 1885, with stone, which had existed five years. Patient very thin and weak; passed urine in drops with great pain. On the 20th, chloroform being given by Dr. Fasken, I operated. On passing a full-sized sound, the stone was met with at the neck of the bladder, and obstructed its advance, but by manipulation the sound was

passed into the bladder *over* the stone. The same difficulty was experienced in passing the lithotrite, and the stone could not be grasped. The lithotrite was therefore withdrawn, a No. 18 cannula introduced as far as the end of the stone lying in the prostatic urethra, the aspirator applied, and water pumped with force into the bladder. By this manœuvre the stone was displaced backwards into the bladder by the force of the stream, the prostatic urethra grasping the stone being at the same time dilated by the water, and so loosening its hold on the stone. The stone was then grasped by the lithotrite, and soon disposed of. The operation lasted twenty-three minutes, the débris of the stone, which was mixed uric acid and phosphates, weighing $5\frac{1}{2}$ drachms. There was some pain in the urethra for a day or two, with some dribbling of water, but the patient was discharged on April 3rd perfectly well.

CHAPTER VI.

LITHOLAPAXY IN MALE CHILDREN AND IN FEMALES.

THE present chapter will deal mainly with the peculiarities of litholapaxy as applied to male children, some brief remarks being added on the operation in females of all ages.

Male Children.—It was not till 1886, four years after I had commenced to perform litholapaxy in adult males, that I extended the operation to male children. Though an ardent advocate of the operation in the adult male and females of all ages, I, like most other surgeons, at first opposed its extension to the case of male children, basing my opposition on the undeveloped condition of the genito-urinary organs—the bladder being small, the urethra narrow, and the mucous membrane sensitive and liable to laceration. On the other hand, perineal lithotomy in the child had always been a comparatively successful operation; and, so far as my own experience of it was concerned, I had no reason in this respect to abandon this operation in favour of litholapaxy, having, before adopting litholapaxy in such cases, performed 145 lithotomies in male children without a death. I may mention that I have now performed 197 lithotomies in male children with only one death. In fact, I had the good fortune of having performed 191 successful consecutive lithotomies in children before a fatal case occurred. In spite of this success, however, I was so

much impressed by the results of litholapaxy in male children announced by Keegan in two very able and interesting papers published in the *Indian Medical Gazette* in 1885, that I at once ordered the necessary instruments, and decided on giving the operation a trial. Since that time I have performed litholapaxy in male children 165 times with two deaths. My first 119 cases were all successful, and I had then the misfortune of losing two cases consecutively. Full details of my first 115 cases were given in three papers in the *British Medical Journal*.* All our foregone theoretical objections to this operation in case of male children have vanished into thin air when pitted against the stern reality of accomplished facts. Notwithstanding the great success I have had with lithotomy, I have now abandoned the operation in favour of litholapaxy, owing to the two great advantages that the latter possesses—rapidity of cure, and avoidance of a cutting operation. The greater my experience of litholapaxy in male children becomes, the more I am fascinated by the operation. In most instances the little patients may be seen playing about the day after the operation, untroubled by any urinary symptom. To Keegan is due the honour of having, in the face of strong opposition and prejudice, shown that litholapaxy in male children is both feasible and safe; and I feel proud that this honour has fallen to a brother officer of the Indian Medical Service, a Service which has done so much to popularize and extend Bigelow's operation.

For the performance of litholapaxy in male children, it is essential that the surgeon should be provided with a series of small fully-fenestrated lithotrites (Fig. 34) of the same patterns as those used for adults, but varying in size from No. 5 to 10. It will be found that in boys aged from 13 to 16 years a lithotrite of size No. 11 or 12 will pass readily as a rule. The cannulæ (Fig. 35) employed are also similar in shape to

* December 24, 1887; October 12, 1889; May 9, 1891.

those used for the adult, but vary in size from No. 6 to 12, English scale. The smaller sizes should be not more than 7 inches in length, as the return stream through these small

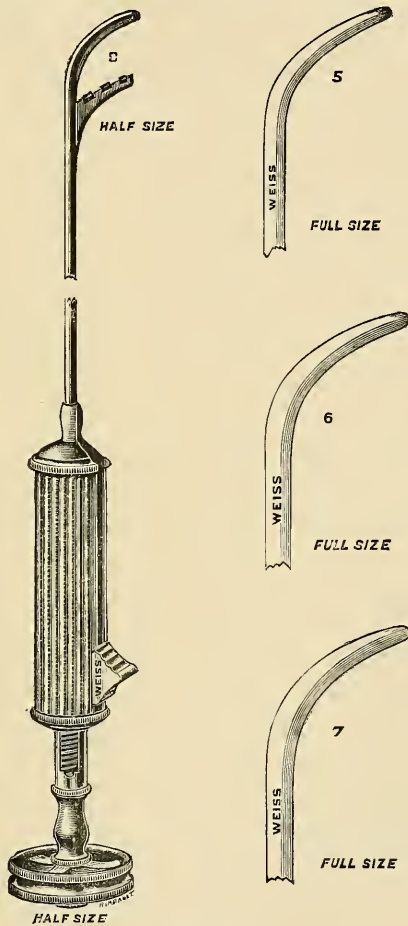


FIG. 34.

cannulæ is very weak, and diminishes in strength with the length of the tube. The aspirator is the same as for adults; but it must of course be worked very gently, only a small

quantity of water proportional to the size of the bladder being thrown in. Any smaller or weaker apparatus will not suffice

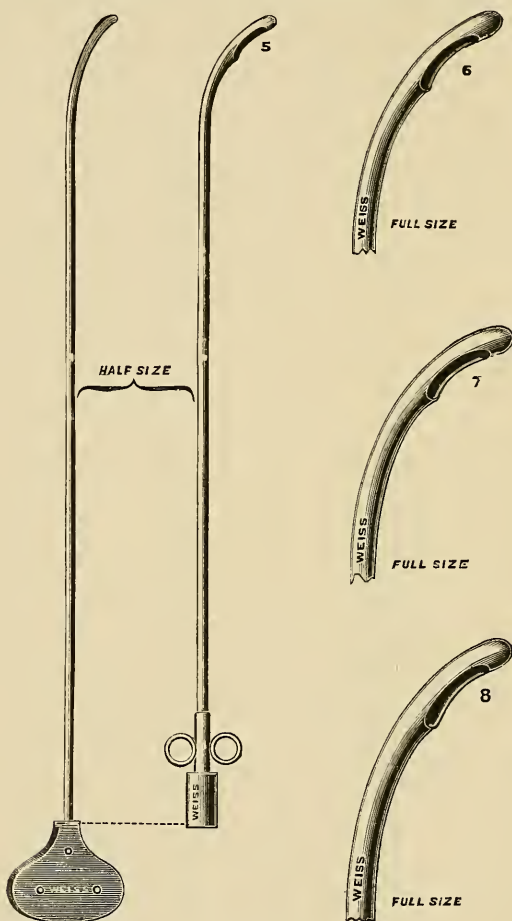


FIG. 35.

to extract débris through the narrow cannulæ, owing to the stream being so feeble.

It will be found that the capacity of the urethra in patients of the same age varies much more in children than in adults.

Keegan was the first to call attention to this fact, which I have frequently verified in my practice. Thus, the urethra of a child of 5 or 6 years of age will frequently be found to admit a No. 10 lithotrite with ease; in other instances a No. 6 is passed with difficulty.

The *meatus* of the urethra in children is, as a rule, very narrow, and almost invariably requires to be enlarged to permit the litholapaxy instruments to pass. The incision should be on the floor of the urethra.

I find that in children, after the *meatus* has been enlarged, the first two inches of the urethra is, as a rule, the narrowest and most difficult part through which to pass the lithotrite; whereas in adults the difficulty, when one occurs, lies generally at the triangular ligament or prostatic portion of the canal.

In children the operation is, for the same size of stone, a much more tedious one than in the adult, owing to the small size of the instruments employed, and the necessity to grind the calculus into very fine débris before it will pass through the cannulæ.

There is more danger of a fragment of stone being left behind in children than in adults. The stream passing through the small tubes employed has not the same evacuating force as in the large cannulæ used in adults. The débris is not, therefore, carried with the same certainty towards the eye of the cannula from the various parts of the bladder; and the fragments do not give out the diagnostic clicking sound so clearly. It is therefore necessary to institute a very careful search by pumping in water and exhausting it, with the eye of the cannula turned in various directions, before the instruments are finally withdrawn. In the hands of a careful and experienced surgeon there is little chance of a fragment being left behind.

Litholapaxy should not be attempted in a child when the

smallest lithotrite at hand is a tight fit for the urethra. When the instruments fit tightly at first, there may be some difficulty in their re-introduction, or even in their withdrawal, owing to the congestion and swelling of the urethral mucous membrane that takes place near the *meatus*. I have noticed this phenomenon, but to a much slighter extent, in young adults, but never in old men.

When the urethra in a male child is capacious, and the calculus of moderate size, litholapaxy can be performed with facility; but when the urethra is very narrow, or the stone large, the operation is a difficult one. In any case, litholapaxy in male children is a much more delicate one than in the adult. I do not think that a surgeon would be at all justified in attempting this operation in a male child till he had had very considerable experience of it in the adult.

If it was necessary to caution the surgeon against the use of force in passing instruments in the adult, this is doubly necessary in the case of children, in whom the mucous membrane and other tissues are so delicate and easily lacerated.

Keegan writes :* ‘*Unquestionably the best, and indeed the only perfectly safe, form of lithotrite to use in performing litholapaxy in young boys is the completely fenestrated pattern of lithotrite.* A partially fenestrated lithotrite is liable to get clogged with débris, and may sometimes retain within its blades a thin sharp projecting fragment of stone, which may lacerate the urethra on the withdrawal of the lithotrite from the bladder. Clogging of the blades of a lithotrite with débris is a very dangerous complication in performing litholapaxy in male children, because it has the effect of increasing the size of the lithotrite, say, from a No. 7 to a No. 8. And as in performing litholapaxy in male children we are dealing with urethræ in which there is, so to speak, not much spare room left to work in, the effect of increasing the size or

* *Lancet*, December, 1886.

number of the lithotrite may be such that in its withdrawal from the bladder the urethra may get unduly stretched or ruptured. Now, it is impossible that clogging can occur between the blades of a completely fenestrated lithotrite. Objecting to the employment of a partially fenestrated lithotrite in performing litholapaxy in male children for the reason already stated, I can only characterize the use of a flat-bladed unfenestrated instrument in operating on this class of patients as *unwarrantable and absolutely dangerous.*' In these remarks I entirely concur.

The youngest child on whom I have performed litholapaxy was one aged 18 months, the details of which are as follows :

Case 276.—A male child, aged 18 months, admitted to the Moradabad Hospital, November 2, 1888, with symptoms of stone of two months' standing. On passing a sound a faint click was heard. Next day I performed litholapaxy in presence of Surgeon-General W. R. Rice. A No. 5 lithotrite passed with the greatest ease, and the tiny stone was at once caught and crushed, and evacuated through a No. 6 cannula. In withdrawing the lithotrite some difficulty was experienced, owing to congestion and spasm of the urethra. The operation lasted eight minutes, and the débris (urates) weighed 3 grains. I saw the child in the evening, and he was passing urine freely and without pain. Next day he was quite well. On the 5th, two days after the operation, the child was taken to the railway station, in order that Dr. Rice, who was passing through, might see him. Dr. Rice expressed much surprise and pleasure at the rapid cure in a child of this age.

This is, as far as I am aware, the youngest child on whom litholapaxy has as yet been performed ; but the facility with which the instruments were introduced convinces me that the modern operation is practicable in even younger children. In this connection I may mention that on June 7, 1889, a male child, 9 months of age, was brought to me with symptoms of stone, but in whom no stone was found. In this case I passed a No. 6 cannula, and washed out the bladder by the aspirator for diagnostic purposes. Had there been a stone present I could have removed it by litholapaxy readily. Keegan also

records* the case of a child, 11 months old, in which he passed a No. 7 cannula, and washed out the bladder for diagnostic purposes. So that litholapaxy is now practicable in children of the most tender ages.

I will now give some instances of large calculi removed from male children by means of small lithotrites :

Case 252.—H. U., male child, aged 9, admitted to Moradabad Hospital, May 23, 1888, with symptoms of stone of four years' standing. Extremely emaciated and suffering from fever. Urine passed in drops every few minutes with great pain. Child danced with agony, rolled about on the floor, and screamed with pain when he attempted to micturate. Prepuce inflamed and ulcerated—result of the child rubbing it to relieve pain.

On May 25 I performed litholapaxy. No. 8 lithotrite passed with ease, and stone at once grasped; but as it was found to measure $1\frac{1}{2}$ inches in diameter, the lithotrite would not lock. This diameter was then changed for a shorter one, on which the lithotrite locked; but the stone was so hard that the lithotrite failed to crush it. I then grasped the stone by one end, and after some manipulation broke off a portion. This was then reduced to fine débris and evacuated through a No. 10 cannula. The lithotrite was again introduced, another portion of the stone chipped off, and treated in a similar manner. This process was continued, and varied from time to time by scraping the sides of the stone by the jaws of the lithotrite, till the whole stone was disposed of, the operation lasting two hours and five minutes. The stone was extremely hard, composed of carbonate of lime, and the débris weighed 765 grains. The lithotrite was introduced fourteen times, and the cannula some sixteen or eighteen times; yet there was scarcely a trace of blood seen during the operation.

When I commenced this operation I had no idea that the calculus was so large and hard, and I must confess that during its progress I had grave misgivings as to the advisability of continuing it, the child was so weak, the stone so hard and large, and the operation so prolonged. Still I persisted till the whole stone was removed. The child was extremely exhausted, and did not regain consciousness for two or three hours after the operation. Slight fever in the evening, but none next day. On the 27th I had the pleasure of showing the case to Surgeon-Major R. Drury. The child was sitting up in bed, quite well and happy. On June 6 the child was discharged cured, and was brought to the hospital on June 12 in excellent health.

Case 288.—Male child, aged 10 years, admitted December 7, 1888, with

* *Lancet*, December, 1886.

stone of one year's duration. Health very bad. Litholapaxy performed next day. The largest lithotrite I could introduce was a No. 5, with which the stone was easily caught, but, owing to its size, the instrument would not lock. Time after time I grasped the sides of the stone and then screwed home the lithotrite, thus scraping off portions of the crust. In this way the stone was eventually reduced to such a size that the lithotrite locked on it, when it was crushed. The operation lasted sixty-five minutes, and the débris (uric) weighed 275 grains. Child much exhausted; passed no urine till evening, when, under the influence of hot fomentations to the perineum and loins, a copious flow of blood-stained urine came away. On the 10th the child was sitting up in bed, and on the 15th he was discharged cured.

Case 605.—Male child, aged 10, admitted to Prince of Wales Hospital, Benares, January 23, 1895, with stone of three years' duration. Suffering great pain; passing blood and pus in urine, which was passed involuntarily every few minutes. Litholapaxy performed at once, Surgeon-Colonel Anthonitz and Surgeon-Captain Paterson being present. No. 8 lithotrite passed and stone caught at once, but as the diameter was $1\frac{3}{4}$ inch, the instrument would not lock. Even the shortest diameter was more than the capacity of the lithotrite. The scraping and chipping process described in Case 252 was resorted to, the instrument being introduced at least a dozen times before the stone was disposed of. No. 10 cannula used. The stone was uric, with oxalate of lime nucleus, and the débris weighed 340 grains. Child very weak after the operation, and continued to dribble urine for three or four days, but was perfectly well on February 1, when discharged.

These cases illustrate the great variation in the capacity of the urethra in children of about the same age, already referred to. In Cases 252 and 605 a No. 8 lithotrite and No. 10 cannula passed with ease, whereas in Case 288 the largest instruments that could be introduced were a No. 5 lithotrite and a No. 6 cannula. They well illustrate the process of 'scraping and chipping'—if I may so call it—by which a lithotrite may be made to crush a stone of larger size than that for which the instrument was constructed. In this way comparatively large stones may be disposed of by small lithotrites, a matter of great significance when we have to deal with narrow urethræ in children. The process of scraping the sides of a stone is a very tedious and delicate one, and

demands much care, patience and perseverance for its successful accomplishment.

The following is a very remarkable case from various aspects, so I will give it in detail.

Case 350.—A Mahomedan boy, aged 15, admitted to the Moradabad Hospital, December 24, 1890, with symptoms of stone of four years' duration. So miserably weak that he was unable to walk or even to stand up; in constant agonising pain, the urine passing in drops continually. Foreskin ulcerated, the result of the patient pulling at it to relieve pain. Spleen enormously hypertrophied, measuring, roughly, 1 foot long by 10 inches broad, and literally filling the abdomen. Had suffered from fever for several months; very anæmic, with pinched, anxious face. The lad was a living skeleton, and presented a miserable spectacle, the result of long suffering. Large stone of irregular shape felt by the sound. The supra-pubic operation suggested itself, but a cutting operation of any kind was out of the question, owing to the wretched health of the lad. Placed under preparatory treatment.

On December 26 I performed litholapaxy (Surgeon-Captain S. F. Freyer present). The largest lithotrite that would pass, after incising the floor of the *meatus*, was a No. 9, and the largest cannula a No. 12. Stone easily caught, but too large for lithotrite to lock on it. By the process of chipping and scraping, I eventually reduced the stone to such a size that the lithotrite locked on it. It was fortunate that the stone was irregular in shape and not very hard, which much facilitated the crushing. The lithotrite and cannula were each several times introduced, and after working for one hour I imagined I had completely emptied the bladder of stone, having removed a mass of *débris* which I roughly estimated to weigh nearly 2 ounces. On careful examination I found, however, that there was a tumour, elongated in shape, in the right groin. This I found to be a second calculus, situated in a pouch, apparently in the line of the ureter. The outline of the stone could be seen through the abdomen; and it could be felt in position between a finger introduced into the rectum and a hand placed on the abdomen. On introducing the lithotrite I could touch the lower end of the stone, which, however, could neither be grasped nor displaced from its bed. The patient was much exhausted from chloroform; so he was put to bed, my intention being to remove the second stone by supra-pubic lithotomy should the boy recover from the operation he had undergone. During the first three days the boy passed urine freely, but with some dribbling. He had slight fever every evening, but on the whole was daily growing stronger.

On December 30 I found the lad in intense pain, with stoppage of urine. On passing a sound I found that the stone had shifted its position, and

was now lying in the bladder right up against its neck; the tumour in the groin had disappeared. The dislodging of the stone from the dilated ureter was due no doubt partly to the other stone, on which it rested, having been removed, and partly to the accumulation of urine behind it pushing it on into the bladder. Patient at once anæsthetized, and litholapaxy again performed. The same instruments as before were used, and a stone of nearly the same size removed. The operation lasted $1\frac{1}{2}$ hours, and the patient was much exhausted.

The débris (urates) removed at the first sitting weighed, when dry, 767 grains, and that at the second 681 grains—total, 1,448 grains, or more than $3\frac{1}{4}$ ounces. For the first three or four days the lad was very low, but on January 11 I had the pleasure of showing him to Surgeon-General W. R. Rice. He was sitting up in bed, quite happy; dribbling of urine had ceased, and his general health had much improved. All urinary symptoms had disappeared on January 20, and he was discharged on January 22 in fairly good general health, the spleen having diminished much in size. On January 28 I met the boy walking about in the streets.

It is in such cases as this that Bigelow's operation stands forth in brilliant contrast with all other operations for stone, rescuing from certain death miserable patients on whom no cutting operation of any kind could be undertaken with any hope of success.

Females.—Amongst 864 operations for stone in the bladder performed by me there were 17 in females, or about 2 per cent. of the whole. Three of these occurred in my lithotomy days, previous to my commencing litholapaxy. These three occurred in children, and the calculi were removed by rapid dilatation of the urethra. Since commencing Bigelow's operation, 14 cases of stone in females (7 children and 7 adults) have come under my treatment, and of these 13 have been treated by litholapaxy with entire success. The remaining case was that of a woman aged 70. I attempted litholapaxy, but the stone, which was uric and weighed exactly two ounces, was so extremely hard that, though it was easily grasped by my largest lithotrite, No. 18, I could make no impression on it, though I used all the force of which I was capable. The stone in this case I successfully removed by vaginal lithotomy.

Litholapaxy in females is, as a rule, not a difficult proceeding, the instruments employed being the same as for males. Even quite young female children admit large lithotrites and cannulæ without any preliminary dilatation of the urethra. The only special difficulty met with is that, owing to the width and shortness of the urethral canal, the water which is necessary in the bladder during the crushing of the stone is liable to rush out beside the instruments. This difficulty is obviated by getting an assistant to place the fore and middle fingers of one hand in the vagina, and to press the posterior lip of the urethra against the lithotrite or cannula, a manœuvre which prevents the water from flowing out. Litholapaxy in females is eminently successful, and the patient may be seen, as a rule, walking about the day after the operation. No forcible dilatation of the urethra being necessary, there is no incontinence of urine, that extremely troublesome sequel which sometimes follows the operation by dilatation. One woman from whom I removed a calculus over an ounce in weight was seven months pregnant. The details of this interesting case are as follows :

Case 390.—M. C., female, aged 25, admitted to Moradabad Hospital, May 11, 1890, with symptoms of stone of one year's standing. Seven months gone in pregnancy. Great pain in the region of the bladder, which becomes so intolerable when she attempts to stand or walk that for three months she has had to keep lying down; this evidently due to pressure of the gravid womb on the bladder with contained stone. When she desires to pass urine, she has to insert her finger in the urethra, and push back the stone from the neck of the bladder. Next day I performed litholapaxy. The stone was at once caught by my No. 15 lithotrite, which had to be three times introduced before the débris was completely extracted. Cannula No. 18 used. No flow of urine beside the instruments, owing to the precautions above indicated having been adopted. The calculus was mainly urates, and weighed 477 grains. Time spent in operating, seventeen minutes. Next day the patient was sitting up and walking about her room, untroubled by any urinary symptom. She stated that she was quite well, and desired to go home. Discharged on 17th quite well.

This is a very interesting case, showing that the operation may be undertaken in the last stages of pregnancy without fear of causing a miscarriage. I hesitated at first about undertaking the operation till after the woman's confinement, but her miserable condition, and the fear that the presence of a large stone in the bladder would greatly interfere with labour, induced me to operate at once.

CHAPTER VII.

INTERESTING CASES, WITH PRACTICAL OBSERVATIONS.

IN the preceding two chapters I have dealt with the chief difficulties and complications met with in the modern operation. I will now give some interesting cases, with practical remarks thereon.

Several patients of eighty years and over had large calculi successfully removed. The oldest on whom I have operated was a Mahomedan, aged 96, from whom I removed successfully a hard uric-acid calculus, the débris of which weighed $9\frac{1}{2}$ drachms, the operation lasting one hour. An interesting feature in this case was that, till about a month before coming under observation, the patient had enjoyed excellent health, and was untroubled by any urinary symptoms. The details of this case are interesting, so I give them.

Case 69.—This was a case in private practice. The patient, a Mahomedan of Moradabad, stated that he was close on 100 years of age, and by calculation he appeared to be 96. He was a dried-up, withered creature, without a tooth in his head, consisting almost of skin and bone. Several of his sons were living, and one of them looked 70 years of age. Till about a month before coming under treatment he had enjoyed good health, and used to walk about daily. He was suffering from well-marked symptoms of stone, especially great pain in passing urine; very weak, and unable to leave his bed. On October 28, 1883, I performed litholapaxy, the débris weighing $9\frac{1}{2}$ drachms, and the operation lasting one hour. The patient made a rapid recovery, and was able to walk about on November 13. Five months afterwards I had the pleasure of

showing this old gentleman to Surgeon-General W. Walker. He was then in excellent health, so much so that Dr. Walker, writing of him at the time, amusingly says : ‘ He must certainly be 90, and looks as if he might live thirty years more, and then do service as an old rail !’

The rapidity with which a stone may be removed from the bladder by the modern operation will vary according to circumstances. The crushing power of the lithotrite, the efficiency of the aspirator, the calibre of the urethra, the shape and capacity of the bladder, the size and hardness of the stone, the dexterity and experience of the operator, are all factors that will have to be taken into consideration. The longest time I have spent over the operation at one sitting was two hours, in Case 517, already described, during which time I removed $6\frac{1}{2}$ ounces of hard stone.

Given, on the other hand, a patient with a capacious urethra and healthy bladder, the rapidity with which a large stone may sometimes be removed by the modern instruments is wonderful. The following cases well illustrate this :

Case 91.—A male, aged 35, admitted into the Bareilly Hospital, June 21, 1884, with the usual symptoms of stone, which had existed two and a half years, the pain being excessive during the last few days before admission. It was necessary to incise the floor of the urethra slightly, and then my largest lithotrite passed with ease. Calculus phosphatic, not very hard; fragments weighed exactly 2 ounces. The operation lasted only seventeen minutes, only two introductions of the instruments being required. Cannula No. 18 was used. The patient recovered without a bad symptom, and was discharged June 30.

Case 562.—A male, aged 60, admitted to Moradabad Hospital, November 3, 1892, with stone of two years’ duration. Health fair. Litholapaxy performed. No. 15 lithotrite and No. 16 cannula introduced twice. Calculus, soft phosphates; weight 557 grains—nearly $1\frac{1}{2}$ ounce. Time occupied by the operation six minutes. Not a drop of blood drawn. On the 5th the patient was sitting up, quite well, and discharged on the 8th.

Not less interesting than the facility with which large calculi may sometimes be removed by the modern operation is the rapidity of the cure that ensues in some cases, even

when the stone is large and the operation prolonged over a considerable period. This has been well illustrated by some of the cases already given. I will give details of two other such cases.

Case 68.—A male, aged 55, came to the Moradabad Hospital, October 20, 1883, suffering from the usual symptoms of stone, which he stated had only troubled him for six months, during which time he had great difficulty in passing water. October 26 I performed litholapaxy, Surgeon-General C. Plauck being present. Calculus very tough and hard to crush; operation lasted thirty-four minutes. Stone partly oxalate of lime, partly uric acid; débris weighed 1 ounce 35 grains. Catheter No. 18 passed easily, without incising the *meatus*. Next day the patient was walking about the hospital as if no operation had been performed. On October 30, the day on which the man was discharged, he presented himself to Dr. Plauck, who was much struck with the rapidity of the cure, having seen the man operated on four days before only. The patient was in high spirits, and gave us an amusing account of the various expedients he used to have recourse to in order to pass urine before the operation. He said that he used to lie on his back, then on his belly, sometimes on one side and then on the other, but frequently without avail. When these positions failed to give him relief, he had recourse to standing on his head with his legs in the air; but even then he frequently could not pass water.

Case 80.—A Mahomedan, aged 45, admitted March 11, 1884, with stone. The symptoms had existed three years. Litholapaxy performed by me, Surgeon S. Thomson being present. The operation lasted half an hour, during which the instruments were introduced four times. The stone was a hard uric-acid one, and the débris weighed 1 ounce $2\frac{1}{2}$ drachms. The patient was walking about the hospital next day, quite well, and desirous of going home. He was discharged March 17, having had no bad symptoms.

In practice in India I was often amused by the naïveté of the peasantry, and the rude devices they frequently have recourse to for the relief of disease. These remarks apply partly to Case 68, above recorded. Of a somewhat similar nature was Case 29, in which, with the assistance of Dr. Wilson, Ghurwal, I removed, on March 5, 1883, a calculus weighing $2\frac{1}{2}$ drachms from a hillman, aged 46. This man informed us that during the previous year he had been in the habit of employing a thin, pliant bamboo twig, which he produced, to

assist him in passing water. This he passed through the urethra, and by means of it pushed back the stone from the neck of the bladder preliminary to passing urine. He now pulled his penis with force, putting it on the stretch, then relaxed it, when some urine passed away with a rush. This process was repeated again and again till his bladder was emptied.

I have already stated that no selection of cases was made, and that patients in the very worst conditions of health were frequently operated on. This will have been apparent from some of the cases already given in detail. In order to illustrate what the modern operation is capable of in rescuing from death many sufferers on whom no cutting operation could be entertained, I am tempted to give details of the following cases :

Case 56.—A Mahomedan, aged 85, was brought to the Moradabad Hospital, August 8, 1883, with symptoms of stone, which had existed five years. Patient extremely exhausted from his sufferings ; a mere skeleton, unable to walk ; carried in a bed. Pain in the bladder very severe ; micturition frequent, only a few drops of urine coming away at a time. No albumen. Patient so weak that no operation could be entertained at once ; kept in hospital for preparatory treatment. On August 12 there was scarcely any improvement ; but, as the man was clamouring for the operation, litholapaxy was performed. Operation lasted nearly an hour ; débris of calculus, which was a hard uric-acid one, weighed nearly $1\frac{3}{4}$ ounces. The urethra admitted the largest lithotrite, and cannula No. 18. With the exception of slight fever for the first day or two, and some pain in micturition, there was not a bad symptom. On the 18th he was walking about the hospital, and expressed himself as ‘feeling forty years younger than before the operation.’ This man was discharged on the 23rd in good health. Some months after, when out in the Terai tiger shooting, I met him in his native village, and he was then quite well.

Case 107.—G. A., Bareilly City, aged 45, came to the hospital, suffering from all the symptoms of stone, which had existed two years. The pinched and anxious expression of his face indicated that he had undergone extreme suffering. He was pale, thin, and anæmic ; and his body and limbs consisted almost solely of skin and bone. In fact, he was a living skeleton. The man was unable to walk from pain and debility, and had to be carried in a bed. My assistant-surgeon and the subordinates of the

hospital considered an operation unadvisable, as the patient was in a dying state. My friend, the late Surgeon-Major J. Corbett, also saw the case, and agreed with me in thinking that, were lithotomy the only alternative, it would be advisable to allow the man to die unoperated on, as he would be certain to sink on the operating table from shock and loss of blood. With the assistance of Dr. Corbett, I performed litholapaxy September 24, removing 2 drachms of hard uric-acid calculus, the operation lasting thirty-five minutes. With the exception of slight fever on the day of the operation, the patient had not a bad symptom, and was discharged October 4, ten days after the operation, in good health. Subsequently, he frequently presented himself at the hospital to show himself, untroubled by any urinary symptom.

These cases are merely illustrative of many of a similar kind in my practice. In neither instance could lithotomy be entertained, as the patient had not an ounce of blood to spare. It is in cases of this kind that the operation of litholapaxy stands forth in brilliant contrast to that of lithotomy, and creates a marked impression by the rapidity of the cure and the undisturbed condition of the parts.

A general impression once prevailed, which finds a reflection in the present day, though to a much more limited extent, to the effect that the Asiatic is a better subject for surgical operation than the European. This impression is altogether erroneous, and contrary to my experience of both races. And I have already shown from large statistics that the mortality from lithotomy in hospital practice in India was, contrary to the prevalent opinion, the same as in England.

There is also an impression prevalent to the effect that natives of India have no fear of the surgical knife. In fact, from the way some people talk and write, it might be inferred that a native submits to a surgical operation as a kind of harmless diversion. This impression is altogether erroneous. A native of India will not, as a rule, submit to a surgical operation till all other modes of treatment fail, and he is driven to it through extreme pain, inconvenience, or danger to life. And it is for this reason that such large calculi are met

with in that country, and that patients suffering from cancer and other diseases present themselves in hospital at a stage when surgical interference is useless.

I have already referred to the varying sensitiveness of the urethra and bladder in different individuals, the passage of instruments in some instances being attended by considerable hæmorrhage, and in others little or no blood being lost. The latter class is well illustrated in the following two cases, which present some additional features of interest, particularly that of changing the long for the short axis of the stone, when the lithotrite will not lock on it in the former position.

Case 42.—A male, aged 45, admitted into the Moradabad Hospital May 18, 1883, with symptoms of stone, which had existed eight or ten years. Health, fair; trace of albumen in the urine. Litholapaxy performed. The calculus was first grasped by the long axis; but, the lithotrite not locking on it, this was changed for the short axis, when the instrument locked. The stone, extremely hard and tough, was composed of carbonate of lime, with an oxalate of lime nucleus. The operation lasted one hour and ten minutes, several introductions of the instruments being required. The débris of the stone weighed $2\frac{1}{2}$ ounces. The stone was so difficult to crush that I feared it would be necessary to postpone the completion of the operation to a second sitting; but, by perseverance, I managed to get away all the débris. During the operation there was not a trace of blood in the washings, nor was there any bleeding from the urethral mucous membrane. The patient recovered without a bad symptom, and was discharged in perfect health, May 29.

Case 111.—A male, aged 55, admitted into the Bareilly Hospital, October 25, 1884, with symptoms of stone, which had existed $2\frac{1}{2}$ years. On the 26th I performed litholapaxy, Surgeons-Majors Knox, Barry, and Corbett being present. On passing the lithotrite, the stone was at once grasped by the long diameter— $2\frac{3}{4}$ inches—but the instrument would not lock. The long axis of the stone was then changed for the short, when the instrument locked. I attempted to crush the stone, but three times failed to do so. I then screwed the blades together with all the force I was capable of, and rested a second or two, when, suddenly, the stone gave way with a loud report that was audible to all the persons in the room. The fragments were then disposed of with comparative ease. The calculus was composed of uric acid, with an oxalate of lime nucleus. The débris weighed 2 ounces and 45 grains. Catheter No. 18 passed with ease. The operation lasted only twenty-six minutes, there being only three

introductions of the instruments. No hæmorrhage—not a trace in the washings. On the 27th the patient was walking about the hospital, passing urine quite clear, and without pain. Discharged cured November 5.

The loud report accompanying the crushing of the stone in Case 111 would suggest the possibility of harm accruing to the bladder by the splintering of the fragments in the case of large stones such as this. In this case, however, the recovery was rapid; and that no injury was done was evident from the fact that there was no bleeding from the bladder at the time, and that subsequently no bad symptoms supervened. I have frequently verified this in other cases; but it is well, in dealing with large and hard stones, to have a considerable quantity of water in the bladder, which acts as a kind of buffer between the fragments and its walls. Owing to the calculus in the bladder being saturated with moisture, the fragments do not fly with force, as in the case of a dry stone.

Amongst my cases of litholapaxy a remarkable instance of spontaneous fracture of stone in the bladder occurred, and, as such cases are extremely rare, perhaps its record may not be out of place here.

Case 30.—A male, aged 35, admitted March 19, 1883, with the usual symptoms of stone, which had existed $1\frac{1}{2}$ years. Thirteen days previous to admission all the symptoms became suddenly aggravated, since which time urine had only been passed in drops with difficulty. On placing the patient on the table with a view to passing the sound, I noticed an elongated, hard, beaded thickening along the course of the urethra, and my first impression was that there was a severe stricture present. Dr. Moran, 6th Bengal Infantry, who kindly assisted me at the operation, remarked that the feeling was like that of urethral calculi. The floor of the meatus was incised, and no less than 1 drachm of calculus débris removed by the urethral forceps and scoop. The whole length of the urethra was filled with pulverized calculus. A sound was then passed, and fragments detected in the bladder. The lithotrite was introduced, and litholapaxy performed. The débris removed from the bladder, exclusive of 60 grains from the urethra, weighed 125 grains. On inspection of the fragments, it was evident that they belonged to one phosphatic calculus. The patient was discharged cured March 27.

The following case illustrates a difficulty, though a slight

one, which I have only once met with, but which I consider of sufficient interest for record here :

Case 125.—S. B., aged 45, admitted to Mussoorie Hospital, September 6, 1885, suffering from the usual symptoms of stone, which had lasted $2\frac{1}{2}$ years. On passing a sound, two calculi were diagnosed. On the 7th I performed litholapaxy, chloroform being given by Surgeon Tyrrell, and Drs. Whittall, Fiddes, Murphy, and Burlton being also present. After slitting the floor of the *meatus*, the large lithotrite passed with ease, and the calculi, which were soft, were easily crushed. The No. 18 cannula passed with facility. On applying the aspirator and attempting to inject water, however, the apparatus failed to work. I made several attempts to pump in water, but to no effect. I then withdrew the cannula, and found that it was full of soft, mortar-like débris, which, when removed by tapping the cannula against a vessel, remained in the form of a cast of the cannula, like a piece of thick macaroni. After this the operation proceeded without further difficulty, and the patient made a speedy recovery. In fact, he was sitting in the hospital inclosure next day. The débris consisted mainly of phosphates, and weighed $4\frac{1}{2}$ drachms. When the obstruction to the ingress of water occurred, I was at a loss to account for it, and first imagined there was spasm of the bladder, such as is sometimes met with even when profound anæsthesia exists; but on withdrawal of the cannula the cause was apparent. The débris, being in a plastic, semi-fluid state, rushed into the cannula immediately it was introduced, and formed a cast of it.

I have already stated that for that form of cystitis which exists as a complication of stone previous to operation, no special treatment is, as a rule, necessary, beyond the removal of the calculus—the cause of the disease. That form of cystitis, however, which so often followed on the old operation of lithotrity, and which, if it did not prove fatal, often left the patients in almost as bad a condition as they were in before the operation, seldom occurs after litholapaxy, and when it does occur is very amenable to treatment.

Should cystitis supervene on the operation, the treatment during the acute stage will consist in perfect rest in bed, the administration of alkalies with demulcent drinks, hot baths, hot fomentations to the hypogastric region, poultices, etc. The local treatment that I have found most effectual in the subacute and chronic stages of cystitis consists in the injection

into the bladder once daily of a weak astringent solution of either nitrate of silver or acetate of lead. These astringent solutions are best applied by means of six-ounce india-rubber bottles (Figs. 36, 37), provided with stopcocks, the nozzles of which fit on to, or inside of, the end of a No. 10 or 12 soft gum-elastic catheter provided with a large oval eye. The process should be commenced by washing out the bladder with

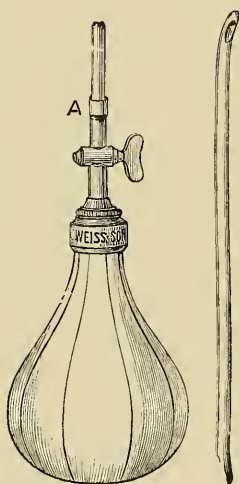


FIG. 36.



FIG. 37.

warm water, to which may be added a trace of carbolic acid or a few drops of a solution of permanganate of potash. When the bladder has been thus cleansed of mucus, pus, and shreds of lymph, the astringent is applied. The astringent solution should at first be very mild, say $\frac{1}{4}$ grain of either of the salts above mentioned to the ounce, and may be gradually increased in strength, no pain or uneasiness being produced.

These remarks do not, however, apply to those cases of phosphatic cystitis sometimes met with in which the chronic disease of the bladder is the *cause* of the formation of soft phosphatic calculi, not the *result*. In such cases the removal

of the calculus will not cure the disease. But the habitual use of the india-rubber bottle and catheter for washing out the bladder with weak astringents will alleviate the symptoms. For this form of chronic cystitis, with a tendency to deposit phosphates on the mucous membrane, I know of no treatment so effectual as a judicious course of the waters of the Contrexéville group; and I say this after careful study, on the spot, of the results obtained at Contrexéville itself and other continental spas reputed for the treatment of gravel and stone, and many years' experience of the administration of these waters in such cases in my own practice. These waters dissolve the catarrhal mucus lining the urinary passages, which, with the entangled phosphates, is carried away with the copious flow of urine induced. Ammoniacal decomposition is checked, the mucous membrane brought into a healthier state, and the acid reaction of the urine restored.

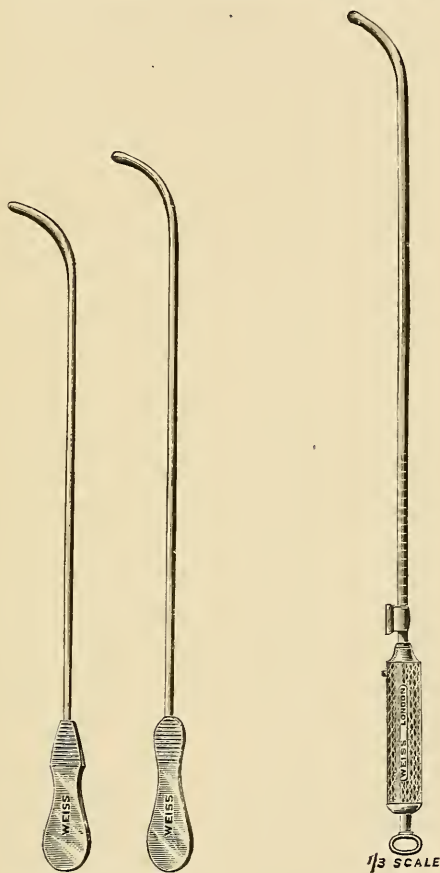
CHAPTER VIII.

SMALL CALCULI: THEIR DIAGNOSIS AND REMOVAL. WHAT IS A STONE IN THE BLADDER ?

IN the great majority of cases that come under observation sounding for stone is a simple proceeding. Almost any sound will detect a large or even moderate-sized stone, when lying free in the bladder. The form of sound I almost invariably use in the first instance is one of the shape illustrated in Fig. 28, proportionate to the age of the patient. A sound of this shape is very easy to introduce, causing the patient little or no pain ; and, in addition to detecting the stone as a rule, affords collateral information regarding the capacity of the urethra. Should I fail to detect the stone by this, I have recourse to a sound (Figs. 38, 39) with a short, well-curved beak and bulbous end, first introduced by Mercier of Paris. The short beak of this instrument permits of its rotation in various directions in the bladder, and particularly behind the prostate when enlarged, where a stone frequently lies and may be passed over by a sound with a long beak. Sir Henry Thompson's sound (Fig. 40) is also a very useful one, as, being hollow, by the removal of the plug at the end of the handle, water can be allowed to flow from the bladder without withdrawing the instrument, and the viscus then searched with varying quantities of fluid in its interior.

I find, however, that with any of these sounds a small calculus, lying in some peculiar position in the bladder, may

evade detection ; and experience teaches us that a patient is frequently sent away from hospital with a stone in his bladder when an opinion to the contrary has been expressed. The detection of such small calculi, before they grow into large



FIGS. 38, 39.

FIG. 40.

ones, is of vital importance, as their removal by the modern method is a very simple proceeding, and, as a rule, unattended by danger.

In the *Indian Medical Gazette*, March, 1884, I called the

attention of the profession to a new method of diagnosis for small calculi, by means of the aspirator and cannula. The method of employing it will be best indicated by a case from actual practice.

Case 54.—On August 1, 1883, a male, aged 50, came to hospital with symptoms of stone, the most marked of which were sudden stoppage of urine and increased frequency of micturition. After a most careful exploration of the bladder by sounds of various kinds, including Sir Henry Thompson's, no calculus could be detected. I felt certain, however, from the symptoms, that there was a small stone present, and determined to employ Bigelow's aspirator for the purpose of diagnosis. I introduced a No. 14 cannula and applied the aspirator. After going through the performance of pumping water into the bladder and exhausting it once or twice, a distinct click was heard. The cannula was withdrawn, the lithotrite introduced, and the stone crushed. The fragments weighed 11 grains only. Next day the man was walking about quite well.

In the above case a most careful search was made by sounds of various kinds, but no calculus could be detected till the aspirator was employed, when a distinct click was heard during the exhaustion of the water, due to the calculus being carried with force against the eye of the cannula by the outward stream. The sound of the fragments clicking against the cannula during aspiration in the operation of litholapaxy first suggested to me this mode of diagnosis, and I now always employ it when the symptoms of stone are present, and the sound fails to detect one. In this way I have detected many small calculi.

The practical advantages of this simple mode of diagnosis for small calculi are borne testimony to by several of my fellow-labourers in this department of surgery, especially by Keegan and Harrison; and I find that it is now very generally employed. Harrison remarks* that 'where the bladder has lost its shape, either by the encroachment of the prostate or

* 'Further Observations on the Treatment of Stone in the Bladder,' by R. Harrison, F.R.C.S., 1885, p. 2.

by the development of saccules, the detection of a small calculus is often attended with considerable difficulty, and may be doubtful.' In cases of this nature, and others 'where stone is suspected, but cannot be readily detected on the introduction of a sound,' Harrison says that he has, since reading my paper in the *Indian Medical Gazette*, systematically employed my method of diagnosis; and adds: 'I have by this instrument (the aspirator-cannula) been enabled in at least a dozen instances, not only to detect the stone without distressing the patient, but at once to remove it.'

A typical example is given by Mr. Harrison:

'In a recent case of irritable bladder with cystitis, which I saw in consultation with Mr. Richard Williams, where we had reason to suspect stone in the bladder, the process was adopted, and may well serve as an illustration. We first carefully examined the bladder, under ether, with a sound, but failed to detect a stone in consequence of the great irregularity in the shape of the inferior portion of the viscus. The aspirator-catheter was substituted for the sound, when calculi were at once found clicking against the eye of the instrument. In this way, not only was the presence of stone demonstrated, but these were readily removed, when we were able to declare that the viscus was free.'

And he adds: 'By this simple process the operation of sounding has been rendered more certain, and freer from those consequences which are sometimes inseparable from the more usual method when required in the case of abnormally shaped bladder.'

Not alone may the aspirator be usefully employed for diagnostic purposes, but by means of it a small calculus, or number of small calculi, may be removed entire, without the necessity of having recourse to the lithotrite at all. Case 76 is a practical illustration of this.

Case 76.—A warder in the Moradabad gaol, aged 50, had been passing gravel for two or three years, when suddenly, on December 17, 1884, his urine ceased to flow. He went to the hospital assistant, who passed a catheter and relieved the retention. Next day he had retention again, when he consulted me at my morning visit to the gaol. I sent him to

the Civil Hospital, placed him under the influence of chloroform, and passed a No. 18 cannula. The aspirator was then applied, and the click of a stone heard. The calculus, which weighed only 15 grains, passed into the apparatus, and was removed in this way, without the use of the lithotrite. Next day the warder returned to his work quite well, having suffered no unpleasant symptoms.

I had for some time previously contemplated the removal of a small calculus in this way by the aspirator alone, but this was the first opportunity I had of putting my idea to a practical test. Since then I have removed calculi in several instances in this manner without the aid of the lithotrite.

When, however, the stone is fixed in position in the bladder, whether in a narrow-mouthed sac, wedged in between the prostate and the wall of the bladder, or held in position by rugose folds of the mucous membrane and tenacious mucus, even this method of diagnosis may fail. It is in cases of this kind that electric illumination of the bladder, which has done so much towards the diagnosis and elucidation of the nature of tumours of that viscus, is peculiarly adapted. This is not the place to enter on a description of the method of employing Leiter's electric cystoscope (Fig. 41). Full details will be found in Fenwick's excellent work, 'The Electric Illumination of the Bladder and Urethra.'

The reader may remember the controversy that took place some time back in the columns of the *British Medical Journal** between Sir Henry Thompson and myself with reference to the question, 'What is a Stone in the Bladder?' In that correspondence Sir Henry attempted to lay down certain novel, but somewhat arbitrary, rules, which, if adopted, would have had the effect of removing these small calculi altogether from the category of stone in the bladder. In the *British Medical Journal* of December 27, 1887, I had published a paper on 'A Recent Series of One Hundred Operations for Stone in the Bladder without a Death,' amongst which there were a

* February 18, July 7, July 14, 1888.

few very small calculi, some of them in children. Taking this paper as his text, Sir Henry formulated certain proposals for the acceptance of the profession, which, in his own words, are as follows :

- (1) ' Any calculus which can be by any means removed entire through

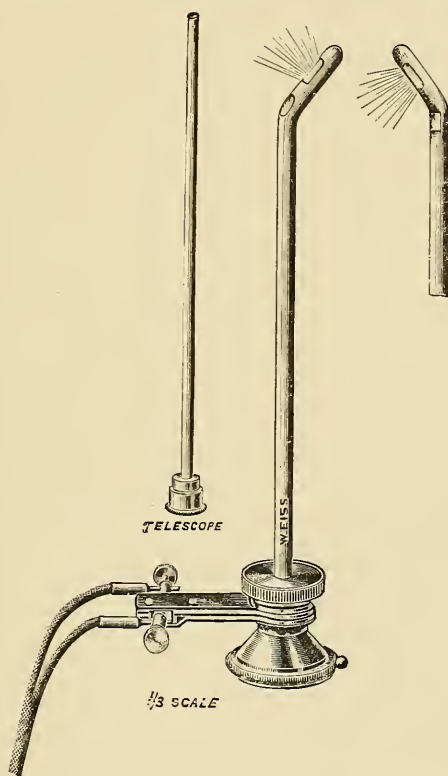


FIG. 41.

the urethra, including one impacted therein and removed thence by the knife, cannot be admitted to rank as a vesical stone, nor can such an operation be regarded as one for stone in the bladder.'

- (2) ' That, for those which are crushed, only formations of a certain weight (20 grains and upwards) can be fairly described by the word stone.'

Why Sir Henry Thompson should have thought it necessary to formulate the self-evident truth contained in the first of these propositions I am at a loss to understand, for who ever heard of a *urethral* calculus being regarded as a stone in the *bladder*, whether removed by the knife or otherwise !

As the second of these propositions seemed to me unscientific, unpractical, and at variance with those principles which Sir Henry himself had laid down for his own guidance during the most active part of his career, I ventured to question the propriety of any such change of nomenclature on the following grounds :

(1) I need scarcely say that from time immemorial the universally accepted definition of stone in the bladder had been : Any calculous formation, no matter of what size, which failed to pass out of the bladder spontaneously, and for the removal of which an operation was necessary.

(2) Sir Henry Thompson's views on this self-same question had, a short time previously, been clearly set forth in his 'Lectures,' delivered at the College of Surgeons in 1884. 'I think,' he therein wrote, 'it will be generally agreed that when a bladder is found for the first time to contain a calculus, whether urate, oxalate, or phosphate, which is too large to be expelled by the natural efforts, the crushing and removal of it (together with others, if such be present), so as to empty the bladder, necessarily constitutes an "operation for the stone," whether it or they be large or small. If a small stone only is present, the patient is fortunate in having it detected, because it would inevitably have become large had it not been discovered, and the operation is then attended with a corresponding increase of risk.'

These, indeed, are words of wisdom, and I submit there could be no stronger condemnation of the position assumed by Sir Henry in 1888, in criticising my work, and of his attempt to eliminate from the category of stone in the bladder

calculi of 20 grains and under, than these words quoted from his writings in 1884 with reference to his own work.

It is to be presumed that the principles here so clearly enunciated were those by which Sir Henry was guided in his practice, and that, if he had no calculi below 20 grains in weight in his collection, this was due to the fact that he had not met with such, or had failed to detect them by the methods of diagnosis employed by him. The fact is, the diagnosis of small calculi of this kind was extremely difficult before the introduction of my method of diagnosis by the cannula and aspirator, already described, and, more recently, of the electric illumination of the bladder by Leiter's cystoscope, so that this fact may to some extent account for their absence from Sir Henry's collection.

(3) It is a well-known fact that these small calculi are frequently attended by symptoms of the most painful and dangerous character, not the least being their liability to pass into the prostatic urethra and cause retention of urine. If not removed when small, they grow into large stones, and it is one of the greatest triumphs of Bigelow's operation, and its development in my hands, that calculi which before baffled detection can now be diagnosed and removed with facility.

(4) Though, as a rule, these small calculi can be removed with absolute safety, experience has taught me that the modern operation in such cases is not altogether devoid of danger, even in the adult, as the following case will show :

Case 274.—A male, aged 32, admitted to the Colvin Hospital, Allahabad, October 4, 1888, with retention of urine, due to stone impacted in the prostatic urethra. Bladder enormously distended; man in fearful agony. Relieved by catheter by my assistant surgeon, the calculus passing backwards into the bladder. Next day I performed litholapaxy, Surgeon-Captain Irwin being present. The calculus was easily caught and crushed, and the débris (weight, 5 grains) removed through a No. 14 cannula, the operation lasting five minutes. During the night the patient had high fever, temperature 106° F., and was wildly delirious. On the 6th the fever was less, but the pulse was extremely weak and rapid, with

cold, clammy perspiration, so that we feared the patient was dying, urine, however, passing freely. On the 8th the fever had gone, and by the 12th the patient was quite well.

Had this patient died, it would be necessary, in accordance with Sir Henry Thompson's proposal, to omit the case from the list of deaths following the operation of litholapaxy! Edmund Owen, in the Lettsomian Lectures, 1890, whilst completely accepting my views in this controversy, in calling attention to this aspect of the case, amusingly emphasized the absurdity of Sir Henry Thompson's proposal.

(5) Sir Henry did not question the right of these small calculi to be regarded as 'stone in the bladder' when a cutting operation is employed for their removal. Shortly after Sir Henry's first paper came to hand, two cases occurred in my practice which presented a timely satire on this new departure in nomenclature. On March 9, 1888, I removed by *litholapaxy* from the bladder of a male child, aged 9 years, a calculus weighing 6 grains, the symptoms having existed two years. On the 16th of the same month I removed by *lithotomy* from a male child, aged $2\frac{1}{2}$ years, a calculus weighing 4 grains, the symptoms having existed two months. Both patients did well. According to Sir Henry Thompson, the latter is to be regarded as a stone in the bladder, but not the former! How then, I would ask, are the results of the two operations to be compared? I find that amongst my 254 lithotomies, there were 34 calculi less than 20 grains in weight; and amongst my 610 litholapaxies, 88 calculi of this size, nearly half of them in children. Sir Henry Thompson's proposal would involve my scoring out the latter, whilst retaining the former on my list of operations for stone in the bladder—a proposition as unscientific as it is absurd.

It was with great diffidence that I had to take exception to Sir Henry Thompson's manner of dealing with the statistics of my work, and particularly to some false impressions left

behind by the perusal of his paper. I should not consider it necessary to refer to the matter again, were it not that I observe that, in a work * recently published by Sir Henry, he again returns to the charge, omitting, however, any allusion to my reply thereto.

One of the impressions left behind was, that any success that I had attained in this branch of surgery was due to my dealing mainly with small calculi. The pages of this work will have shown how utterly groundless was this impression, and that if I have pushed Bigelow's operation in the direction of small calculi, I have not refrained from grappling with those of very large size.

I think that it will be generally agreed that after we reach a certain size of stone—say one drachm—the difficulty of dealing with, and the danger attaching to the removal of, a stone will increase directly with its size; and that, taking the small with the large, the *average weight* of calculi removed by any particular surgeon will give the best indication of the difficulty of the cases dealt with. Considering the marked manner in which Sir Henry Thompson calls attention to the cases of small calculi removed by me, and the importance he seems to give to his having no calculi below 20 grains in his list, it might be reasonably anticipated that he is in the habit of dealing with larger stones than I am; and that the average weight of his calculi would show a large excess over that of mine. But what are the facts of the case? I refer the reader to the very able monograph on Lithotrity, in Heath's *Dictionary of Surgery*, written by Mr. Cadge, of Norwich, in which he points out that the average weight of stone in my first 108 cases of litholapaxy was 317 grains (nearly $\frac{3}{4}$ of an ounce), whereas the average weight in Sir Henry Thompson's 75 cases done by Bigelow's method was 130 grains (a little over $\frac{1}{4}$ of an ounce). That is to say, the average weight of my calculi was nearly two and a half times larger than that of Sir Henry

* Introduction to 'Catalogue of Calculi,' 1894.

Thompson's. These facts dispose of the erroneous impression I have referred to.

From the vague and indefinite way in which, whilst dealing with my cases, Sir Henry wrote about the possibility of his increasing the number of his operations by recording all his cases of recurrent stone, the impression was conveyed that I had utilized this method of augmenting my operations. As I have already pointed out in Chapter IV., my 610 litholapaxies occurred in 599 different individuals—there being only 11 recurrent operations. And I may add that my 864 operations for stone, by all methods, occurred in 849 different individuals, giving 15 recurrent operations in all. From Sir Henry's recent work already referred to (p. 23), I find that his 1,007 operations for stone by all methods occurred in 887 individuals, giving no less than 120 recurrent operations!

On further examination of these statistics, I find the remarkable fact brought out that these recurrences all took place amongst Sir Henry's *lithotrity* patients. Thus, there were 850 lithotrities on 730 individuals, giving over 16 per cent. of recurrences; and 155 lithotomies, besides 2 extractions by dilatation of the urethra in females, in 157 persons. Amongst these latter 157 operations by lithotomy in patients of all ages there were 49 deaths, or 31·21 per cent. Allowing for this very high mortality, there remained 108 patients in whom no recurrence of stone took place. How does it happen that in Sir Henry's practice there were no recurrences amongst his lithotomy cases, whilst he has had such a large percentage of recurrent stones amongst his lithotrity operations? This fact Sir Henry does not explain; but one is irresistibly driven to the conclusion that it was due to something inherent in the operation; and that these frequent recurrences after his lithotrities were in large part due to a diseased state of the bladder remaining after the operation, which favoured the formation of phosphatic stones, or to fragments left behind, which formed the nuclei of fresh calculi.

CHAPTER IX.

CONCLUDING REMARKS.

To sum up, then, it will be observed that litholapaxy is the operation advocated, as a rule, in patients of all ages and both sexes suffering from stone in the bladder. There must, however, always remain a small number of cases in which this operation will be inapplicable. Such cases are: (1) When the stone is extremely large and hard; (2) some cases of encysted calculi, particularly when the sac is narrow-mouthed; (3) calculi partially impacted in the prostatic urethra, which cannot be displaced backwards into the bladder; (4) when the stone co-exists with tumour of the bladder, and it is desirable to empty the viscus of both growths at one operation; (5) where there is great enlargement of the prostate; (6) when tight cartilaginous stricture of the urethra complicates the case; and (7) when the bladder is contracted, rigid and irritable, resenting the presence of water, and not allowing room for the manipulation of lithotrites. In such cases lithotomy of some kind must still be had recourse to; and the kind of lithotomy—whether lateral, median, or suprapubic—will depend on the circumstances of the particular case. As the surgeon gains experience of the modern operation, the number of cases in which the use of the knife will be necessary will gradually diminish. As I have already mentioned, there were amongst my last 300 cases of stone only 6 lithotomies, litholapaxy having been found feasible in

all the others. Several of the cases of stone, even in the adult, treated by me by lithotomy after I began to practise litholapaxy I would now, with my present experience, treat by the latter operation.

The old operation of lithotrity, as practised by Civiale and Thompson, may now be regarded as dead and buried. Under no circumstances can I conceive its practice justifiable; that is to say, with modern appliances at hand, under no circumstances should a stone be crushed and its fragments allowed to remain in the bladder to come away by natural efforts.

In an article in the *Lancet* published in 1885, already referred to, I ventured to appeal to the profession that Bigelow's operation should be universally recognised to be, what it undoubtedly was, a distinctly new operation. This appeal was necessary owing solely to the attitude of Sir Henry Thompson in regard to the operation. Shortly after the introduction of litholapaxy, Sir Henry assumed a position of opposition to this view. In a lecture delivered at University College Hospital in December, 1878,* an attempt was made by him to show that the new operation had been gradually developed out of the old operation of lithotrity, the previous existence of Clover's syringe, and the assertion that Sir Henry himself had, during the previous two years, been in the habit of doing more at each sitting, both in the way of crushing and removal of fragments, than formerly, being mainly relied on as the connecting links in establishing their identity. Bigelow's share in the development of the operation was minimized; his instruments were denounced as incapable of performing the work assigned to them, and held up to ridicule as 'enormous and unwieldy,'—suggesting to Sir Henry's mind 'some resuscitated relics of the early history of lithotrity,' reminding him of 'the terrible engines used by Heurteloup,'—and disastrous results were anticipated from the

* *Lancet*, vol. i., 1879, p. 145.

alleged proposal of Bigelow, 'to make the rule absolute to remove at one sitting an entire stone, no matter how large it may be or what the condition of the patient,' a proposal which would seem to have had its origin in the imagination of the lecturer, for Bigelow asserts that no such proposal had ever been made by him. Read by the light of many years' practical experience of the operation all over the world, the gloomy anticipations then expressed do not appear to have been realized. Sir Henry seems to have altered his opinions very materially since that time, for we find from his most recent writings that lithotrites and evacuating catheters, which were then pronounced dangerous and unnecessary, are now held to be admissible, and even necessary, when dealing with large calculi.

It is rather strange that Sir Henry Thompson should claim for Clover's syringe an efficiency as an aspirator which in its original and unmodified form it never possessed. The apparatus is referred to by most authors as a pretty and ingenious one for washing out the bladder. Its use in lithotripsy is, however, deprecated, save in exceptional cases, such as where enlargement of the prostate or atony of the bladder co-exists; and then the only efficiency claimed for it is that of washing out sand. Thus Mr. Cadge, of Norwich, writes: * 'In doing this [removing calculi under the circumstances above referred to] I have sometimes used Clover's syringe, but more frequently have trusted to the quicker and less disturbing action of the scoop lithotrite.' In 1869 Sir Henry Thompson, writing of the removal of fragments by Clover's syringe, † says: 'The process is rather trying, however, for the bladder; and it costs rather more pain and time than an ordinary sitting for lithotripsy.' Again, in 1871, he writes: ‡ 'Having used it [Clover's apparatus] very

* *Lancet*, vol. i., 1879, p. 471.

† 'Diseases of the Urinary Organs,' p. 125.

‡ 'Practical Lithotripsy and Lithotomy,' p. 215.

frequently, I would add that it is necessary to use all such apparatus with extreme gentleness, and I prefer to do without it if possible.' And that, even so late as 1878, Sir Henry relied much more on the flat-bladed lithotrite for the evacuation of the débris (Fergusson's method) than on Clover's syringe, is apparent from a passage in the lecture delivered by him in December, 1878, already referred to.

Bigelow applied the name 'litholapaxy' to his operation; but to this Sir Henry Thompson objects, suggesting 'lithotrity at one sitting' as more appropriate. Now, I think there are many advantages in having a distinctly new name for a distinctly new departure in surgery. The word litholapaxy (*λίθος*, a stone, and *λαπάξις*, evacuation) seems to me the one most expressive of the procedure involved in the new operation. Bigelow's operation involves much more than the crushing of the stone, the essential feature being its complete and rapid evacuation. Besides, as I have already pointed out, there are many cases in which a small calculus can be removed by the aspirator alone, in which no crushing is required, and to which, consequently, the name 'lithotrity at one sitting' cannot be applied, whereas the word 'litholapaxy' will also embrace these.

There can be no doubt whatever that Bigelow's operation was a distinct innovation both as regards the principles involved and the means by which it was accomplished. The operation struck at the root of all previously held tenets regarding lithotrity; and its introduction caused at the time astonishment to the profession all over the world. I must confess my surprise that Sir Henry Thompson, after employing Bigelow's operation in all its essential details during several years, and obtaining from it such good results as those recorded by him, should still persist in saying* that 'Bigelow's procedure does not introduce any principle or mode of action

* 'Diseases of the Urinary Organs,' eighth edition (1888), p. 229.

that was not employed before'; and that he should refrain from according to Bigelow that credit to which he is justly entitled for his originality.

Received at first with caution, the operation has steadily grown in favour with the profession all over the world. In the first edition of this work I wrote: 'In India litholapaxy has as yet been adopted by a few surgeons only; but I am convinced that the operation is destined to play an important part in the surgery of the future in this country, where unrivalled opportunities abound for its practice, in reducing by a large percentage the mortality, as well as the suffering, attendant on stone in the bladder. I can testify to the immense popularity of the modern operation amongst the natives of India; and it may be reasonably anticipated that, when it becomes generally known that a small calculus may be removed from the bladder by an operation that involves no cutting, little or no pain, and confinement to hospital for a few days only, patients will present themselves for treatment at an early stage of the disease, when it is most amenable to treatment, and when the operation is almost unattended with danger.' That these anticipations have been realized will, I think, be acknowledged when I mention that Surgeon-Colonel Keegan, who has recently been collecting statistics, writes me that, in the Government Hospitals of the North-west Provinces, Punjab and Bombay alone, there were 7,694 litholapaxies performed in patients of all ages in the four years, 1891-94, with 255 deaths, or a mortality of 3·45 per cent.! Sir Henry Thompson tells us there is nothing new in Bigelow's operation. Let us contrast its history in India with that of lithotripsy. How did it happen that previous to the appearance of Bigelow on the scene in 1878, there were not half a dozen lithotrities undertaken annually in the whole of India? This was simply due to the fact that, in spite of the persistent and able advocacy of Sir Henry Thompson on

behalf of lithotrity, the profession in India looked askance at it, and regarded lithotomy as a better operation. But in litholapaxy the profession saw a new and distinct advance in surgery, and they were not slow in taking advantage thereof, with the result that year by year the tendency is for litholapaxy to replace lithotomy more and more.

Litholapaxy is no longer on its trial: it is now a firmly established practice: it has completely replaced lithotrity; and is destined to replace all forms of lithotomy, save in very exceptional cases. The prejudice against the modern operation that existed in the minds of many surgeons, due mainly to its having been confounded with the old operation of lithotrity, has been gradually vanishing, and must completely vanish before the stern reality of results such as those recorded in this monograph. The surgeon who would give his patients suffering from stone the best prospect of recovery must practise litholapaxy. I believe I have pushed the operation, as regards the size and hardness of the calculi attacked, the ages and debilitated conditions of the patients operated on, as far as any living surgeon, and I cannot speak in terms too high of it. By litholapaxy the surgery of the bladder has been truly revolutionized; and I confidently anticipate that, with increased perfection in the instruments employed, larger calculi than any hitherto attacked will successfully yield to the operation.

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